Subclones of portions of the 200 kDa protein gene from λEMBL3 clone 8II and PCR amplification of 5' region

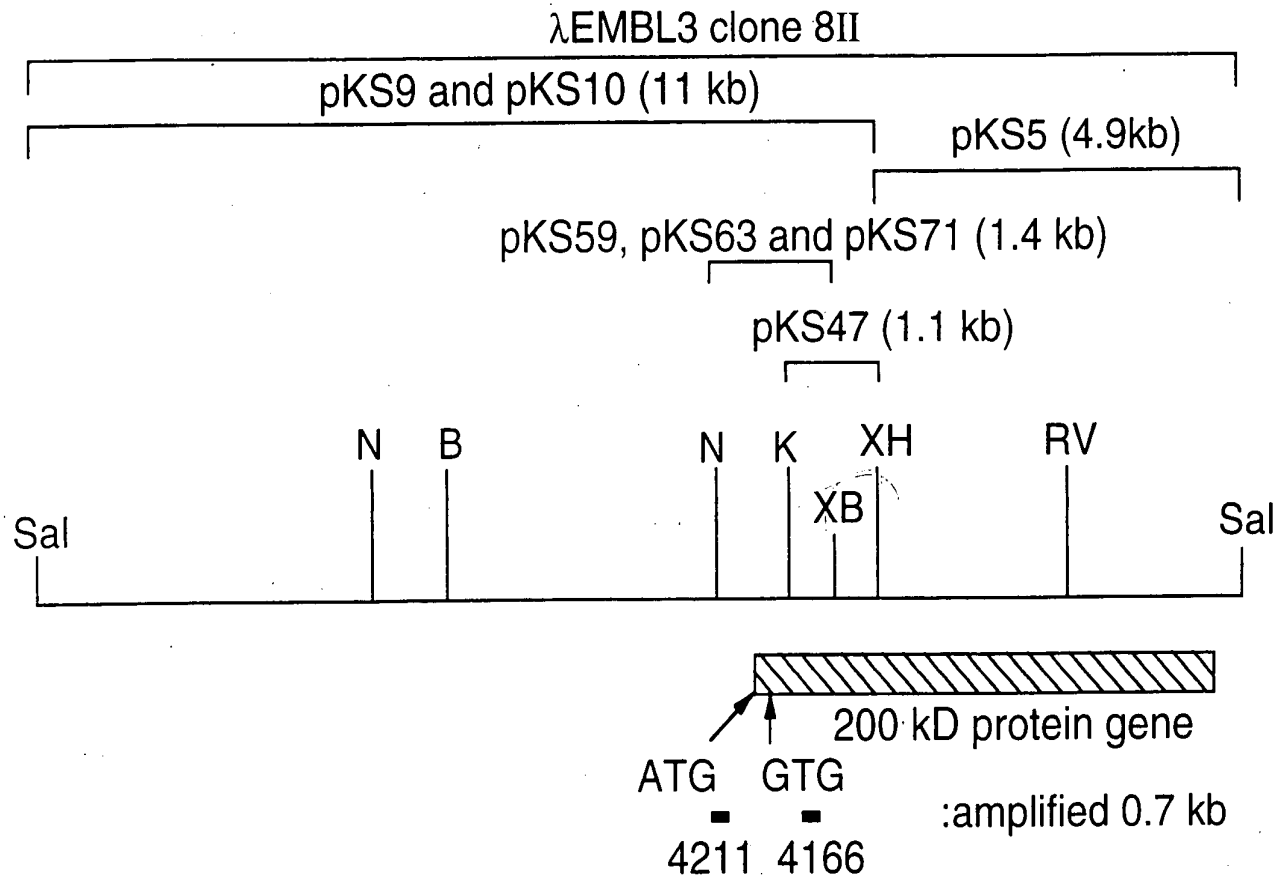


FIG.1

FIG.2A

M. catarrhalis strain 4223 λEMBL3 clone 200kDa gene

ccatggatat gggcaggtgt gctcgcctgc cgtatgatgg cgatgacacc ccatttgccc 60

catatctgta cgatttgaca tgtgatatga tttaacatgt gacatgattt aacattgttt 120

aatactgttg ccatcattac cataatttag taacgcattt agtaacgcat ttgtaaaaat 180

cattgcgccc ctttatgtgt atcatatgaa tagaatatta tgattgtatc tgattattgt 240

atcagaatgg tgatgctata tgatgatgcc tacgagttga tttgggttaa tcactctatg 300

atttgatata ttttgaaact aatctattga cttaaatcac catatggtta taatttagca 360

taatggtagg ctttttgtaa aaatcacatc gcaatattgt tctactgtta ctaccatgct 420

tgaatgacga tcccaatcac cagattcatt caagtgatgt gtttgtatac gcaccattta 480

ccctaattat ttcaatcaaa tgcctatgtc agcatgtatc atttttttaa ggtaaaccac 540

catgaatcac atctataaag tcatctttaa caaagccaca ggcacattta tggcagtggc 600

agagtacgcc aaatcccaca gcacgggggg ggggtagctg tgctacaggg caagttggca 660

FIG.2B

```
gtgtatgcac tctgagcttt gcccgtattg ccgcgctcgc tgtcctc gtg atc ggt   716
                                                    Val Ile Gly
                                                      1

gca acg ctc agt ggc agt gct tat gct caa aaa aaa gat acc aaa cat   764
Ala Thr Leu Ser Gly Ser Ala Tyr Ala Gln Lys Lys Asp Thr Lys His
      5                  10                  15

atc gca att ggt gaa caa aac cag cca aga cgc tca ggc act gcc aag   812
Ile Ala Ile Gly Glu Gln Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys
 20                  25                  30                  35

gcg gac ggt gat cga gcc att gct att ggt gaa aat gct aac gca cag   860
Ala Asp Gly Asp Arg Ala Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln
                 40                  45                  50

ggc ggt caa gcc atc gcc atc ggt agt agt aat aaa act gtc aat gga   908
Gly Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr Val Asn Gly
             55                  60                  65

agc agt ttg gat aag ata ggt acc gat gct acg ggt caa gag tcc atc   956
Ser Ser Leu Asp Lys Ile Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile
         70                  75                  80
```

FIG.2C

```
gcc atc ggt ggt gat gta aag gct agt ggt gat gcc tcg att gcc atc   1004
Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile
     85                  90                  95

ggt agt gat gac tta cat ttg ctt gat cag cat ggt aat cct aaa cat   1052
Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn Pro Lys His
100                 105                 110                 115

ccg aaa ggt act ctg att aac gat ctt att aac ggc cat gca gta tta   1100
Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His Ala Val Leu
                120                 125                 130

aaa gaa ata cga agc tca aag gat aat gat gta aaa tat aga cgc aca   1148
Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr
            135                 140                 145

acc gca agc gga cac gcc agt act gca gtg gga gcc atg tca tat gca   1196
Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met Ser Tyr Ala
        150                 155                 160

cag ggt cat ttt tcc aac gcc ttt ggt aca cgg gca aca gct aaa agt   1244
Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser
    165                 170                 175
```

FIG.2D

```
gcc tat tcc ttg gca gtg ggt ctt gcc gcc aca gcc gag ggc caa tct   1292
Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser
180                 185                 190                 195

aca atc gct att ggt tct gat gca aca tct agc tcg ttg gga gcg ata   1340
Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu Gly Ala Ile
                200                 205                 210

gcc ctt ggt gca ggt act cgt gct cag cta cag ggc agt att gcc cta   1388
Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu
            215                 220                 225

ggt caa ggt tct gtt gtc act cag agt gat aat aat tct aga ccg gcc   1436
Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala
        230                 235                 240

tat aca cca aat acc cag gca cta gac ccc aag ttt caa gcc acc aat   1484
Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn
    245                 250                 255

aat acg aag gcg ggt cca ctt tcc att ggt agt aac tct atc aaa cgt   1532
Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg
260                 265                 270                 275
```

FIG.2E

```
aaa atc atc aat gtc ggt gca ggt gtt aat aaa acc gat gcg gtc aat   1580
Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp Ala Val Asn
                280                 285                 290

gtg gca cag cta gaa gcg gtg gtg aag tgg gct aag gag cgt aga att   1628
Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu Arg Arg Ile
            295                 300                 305

act ttt cag ggt gat gat aac agt act gac gta aaa ata ggt ttg gat   1676
Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile Gly Leu Asp
        310                 315                 320

aat act tta act att aaa ggt ggt gca gag acc aac gca tta acc gat   1724
Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp
    325                 330                 335

aat aat atc ggt gtg gta aaa gag gct gat aat agt ggt ctg aaa gtt   1772
Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly Leu Lys Val
340                 345                 350                 355

aaa ctt gct aaa act tta aac aat ctt act gag gtg aat aca act aca   1820
Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn Thr Thr Thr
                360                 365                 370
```

FIG.2F

```
tta aat gcc aca acc aca gtt aag gta ggt agt agt agt act aca   1868
Leu Asn Ala Thr Thr Thr Val Lys Val Gly Ser Ser Ser Thr Thr
            375                 380                 385

gct gaa tta ttg agt gat agt tta acc ttt acc cag ccc aat aca ggc   1916
Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly
        390                 395                 400

agt caa agc aca agc aaa acc gtc tat ggc gtt aat ggg gtg aag ttt   1964
Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly Val Lys Phe
    405                 410                 415

act aat aat gca gaa aca aca gca gca atc ggc act act cgt att acc   2012
Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr
420                 425                 430                 435

aga gat aaa att ggc ttt gct cga gat ggt gat gtt gat gaa aaa caa   2060
Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp Glu Lys Gln
                440                 445                 450

gca cca tat ttg gat aaa aaa caa ctt aaa gtg ggt agt gtt gca att   2108
Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser Val Ala Ile
            455                 460                 465
```

FIG.2G

```
acc ata gac aat ggc att gat gca ggt aat aaa aag atc agt aat ctt   2156
Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu
        470                 475                 480

gcc aaa ggt agc agt gct aac gat gcg gtt acc atc gaa cag ctc aaa   2204
Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu Gln Leu Lys
    485                 490                 495

gcc gcc aag cct act tta aac gca ggc gct ggc atc agt gtc aca cct   2252
Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser Val Thr Pro
500                 505                 510                 515

act gaa ata tca gtt gat gct aag agt ggc aat gtt acc gcc cca act   2300
Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr Ala Pro Thr
                520                 525                 530

tac aac att ggc gtg aaa acc acc gag ctt aac agt gat ggc act agt   2348
Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser
            535                 540                 545

gat aaa ttt agt gtt aag ggt agt ggt acg aac aat agc tta gtt acc   2396
Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser Leu Val Thr
        550                 555                 560
```

FIG.2H

```
gcc gaa cat ttg gca agc tat cta aat gaa gtc aat cga acg gct gac   2444
Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp
    565                 570                 575

agt gct cta caa agc ttt acc gtt aaa gaa gaa gac gat gat gac gcc   2492
Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp Asp Asp Ala
580                 585                 590                 595

aac gct atc acc gtg gct aaa gat acg aca aaa aat gcc ggc gca gtc   2540
Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala Gly Ala Val
                600                 605                 610

agc atc tta aaa ctc aaa ggt aaa aac ggt cta acg gtt gct acc aaa   2588
Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val Ala Thr Lys
            615                 620                 625

aaa gat ggt acg gtt acc ttt ggg ctt agc caa gat agc ggt ctg acc   2636
Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr
        630                 635                 640

att ggc aaa agc acc cta aac aac gat ggc ttg act gtt aaa gat acc   2684
Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val Lys Asp Thr
    645                 650                 655
```

FIG.2I

```
aac gaa caa atc caa gtc ggt gct aat ggc att aaa ttt act aat gtg   2732
Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe Thr Asn Val
660                 665                 670                 675

aat ggt agt aat cca ggt act ggc att gca aat acc gct cgc att acc   2780
Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala Arg Ile Thr
                680                 685                 690

aga gat aaa att ggc ttt gct ggt tct gat ggt gca gtt gat aca aac   2828
Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val Asp Thr Asn
            695                 700                 705

aaa cct tat ctt gat caa gac aag cta caa gtt ggc aat gtt aag att   2876
Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn Val Lys Ile
        710                 715                 720

acc aac act ggc att aac gca ggt ggt aaa gcc atc aca ggg ctg tcc   2924
Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser
    725                 730                 735

cca aca ctg cct agc att gcc gat caa agt agc cgc aac ata gaa ctg   2972
Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu
740                 745                 750                 755
```

FIG.2J

```
ggc aat aca atc caa gac aaa gac aaa tcc aac gct gcc agc att aat   3020
Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn
                760                 765                 770

gat ata tta aat aca ggc ttt aac cta aaa aat aat aac aac ccc att   3068
Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn Asn Pro Ile
            775                 780                 785

gac ttt gtc tcc act tat gac att gtt gac ttt gcc aat ggc aat gcc   3116
Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn Gly Asn Ala
        790                 795                 800

acc acc gcc aca gta acc cat gat acc gct aac aaa acc agt aaa gtg   3164
Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr Ser Lys Val
    805                 810                 815

gta tat gat gtg aat gtg gat gat aca acc att cat cta aca ggc act   3212
Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu Thr Gly Thr
820                 825                 830                 835

gat gac aat aaa aaa ctt ggc gtc aaa acc acc aaa ctg aac aaa aca   3260
Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu Asn Lys Thr
                840                 845                 850
```

FIG.2K

```
agt gct aat ggt aat aca gca act aac ttt aat gtt aac tct agt gat   3308
Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn Ser Ser Asp
            855                 860                 865

gaa gat gcc ctt gtt aac gcc aaa gac atc gcc gaa aat cta aac acc   3356
Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr
        870                 875                 880

cta gcc aag gaa att cac acc acc aaa ggc aca gca gac acc gcc cta   3404
Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu
    885                 890                 895

caa acc ttt acc gtt aaa aag gta gat gaa aat aat aat gct gat gac   3452
Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn Ala Asp Asp
900                 905                 910                 915

gcc aac gcc atc acc gtg ggt caa aag aac gca aat aat caa gtc aac   3500
Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn Gln Val Asn
                920                 925                 930

acc cta aca ctc aaa ggt gaa aac ggt ctt aat att aaa acc gac aaa   3548
Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys
            935                 940                 945
```

FIG.2L

```
aat ggt acg gtt acc ttt ggc att aac acc aca agc ggt ctt aaa gcc   3596
Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly Leu Lys Ala
        950                 955                 960

ggc aaa agc acc cta aac gac ggt ggc ttg tct att aaa aac ccc act   3644
Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr
    965                 970                 975

ggt agc gaa caa atc caa gtc ggt gct gat ggc gtg aag ttt gcc aag   3692
Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys Phe Ala Lys
980                 985                 990                 995

gtt aat aat aat ggt gtt gta ggt gct ggc att gat ggc aca act cgc   3740
Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly Thr Thr Arg
                1000                1005                1010

att acc aga gat gaa att ggc ttt act ggg act aat ggc tca ctt gat   3788
Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp
            1015                1020                1025

aaa agc aaa ccc cac cta agc aaa gac ggc att aac gca ggt ggt aaa   3836
Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys
        1030                1035                1040
```

FIG.2M

```
aag att acc aac att caa tca ggt gag att gcc caa aac agc cat gat   3884
Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn Ser His Asp
   1045                1050                1055

gct gtg aca ggc ggc aag att tat gat tta aaa acc gaa ctt gaa aac   3932
Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn
1060                1065                1070                1075

aaa atc agc agt act gcc aaa aca gca caa aac tca tta cac gaa ttc   3980
Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu His Glu Phe
                1080                1085                1090

tca gta gca gat gaa caa ggt aat aac ttt acg gtt agt aac cct tac   4028
Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr
           1095                1100                1105

tcc agt tat gac acc tca aag acc tct gat gtc atc acc ttt gca ggt   4076
Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala Gly
      1110                1115                1120

gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg cgt gtg ggc   4124
Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val Gly
   1125                1130                1135
```

FIG.2N

```
att gac caa acc aaa ggc tta acc acg cct aag ctg acc gtg ggt aat   4172
Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Asn
1140                1145                1150                1155

aat aat ggc aaa ggc att gtc att gac agc caa aat ggt caa aat acc   4220
Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly Gln Asn Thr
                1160                1165                1170

atc aca gga cta agc aac act cta gct aat gtt acc aat gat aaa ggt   4268
Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Lys Gly
          1175                1180                1185

agc gta cgc acc aca gaa cag ggc aat ata atc aaa gac gaa gac aaa   4316
Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys
      1190                1195                1200

acc cgt gcc gcc agc att gtt gat gtg cta agc gca ggc ttt aac ttg   4364
Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu
  1205                1210                1215

caa ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat gac acc gtc   4412
Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val
1220                1225                1230                1235
```

FIG.2O

```
aac ttt gcc gat ggc aat gcc acc acc gct aag gtg acc tat gat gac   4460
Asn Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp
                1240                1245                1250

aca agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg gat gat aca   4508
Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr
            1255                1260                1265

acc att gaa gtt aaa gat aaa aaa ctt ggc gta aaa acc acc aca ttg   4556
Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu
        1270                1275                1280

acc agt act ggc aca ggt gct aat aaa ttt gcc cta agc aat caa gct   4604
Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala
    1285                1290                1295

act ggc gat gcg ctt gtc aag gcc agt gat atc gtt gct cat cta aac   4652
Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn
1300                1305                1310                1315

acc tta tct ggc gac atc caa act gcc aaa ggg gca agc caa gcg aac   4700
Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn
                1320                1325                1330
```

FIG.2P

```
aac tca gca ggc tat gtg gat gct gat ggc aat aag gtc atc tat gac   4748
Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp
          1335                1340                1345

agt acc gat aac aag tac tat caa gcc aaa aat gat ggc aca gtt gat   4796
Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp
       1350                1355                1360

aaa acc aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa gcc caa acc   4844
Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr
   1365                1370                1375

cca gat ggc aca ttg gct caa atg aat gtc aaa tca gtc att aac aaa   4892
Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys
1380                1385                1390                1395

gaa caa gta aat gat gcc aat aaa aag caa ggc atc aat gaa gac aac   4940
Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn
               1400                1405                1410

gcc ttt gtt aaa gga ctt gaa aaa gcc gct tct gat aac aaa acc aaa   4988
Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys
          1415                1420                1425
```

FIG.2Q

```
aac gcc gca gta act gtg ggt gat tta aat gcc gtt gcc caa aca ccg   5036
Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro
      1430                1435                1440

ctg acc ttt gca ggg gat aca ggc aca acg gct aaa aaa ctg ggc gag   5084
Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu
   1445                1450                1455

act ttg acc atc aaa ggt ggg caa aca gac acc aat aag cta acc gat   5132
Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp
1460                1465                1470                1475

aat aac atc ggt gtg gta gca ggt act gat ggc ttc act gtc aaa ctt   5180
Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu
                1480                1485                1490

gcc aaa gac cta acc aat ctt aac agc gtt aat gca ggt ggc acc aaa   5228
Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys
          1495                1500                1505

att gat gac aaa ggc gtg tct ttt gta gac tca agc ggt caa gcc aaa   5276
Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys
      1510                1515                1520
```

FIG.2R

```
gca aac acc cct gtg cta agt gcc aat ggg ctg gac ctg ggt ggc aag   5324
Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys
  1525                1530                1535

gtc atc agt aat gtg ggc aaa ggc aca aaa gat acc gac gct gcc aat   5372
Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn
1540                1545                1550                1555

gta caa cag tta aac gaa gta cgc aac ttg ttg ggt ctt ggt aat gct   5420
Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala
                1560                1565                1570

ggt aat gat aac gct gac ggc aat cag gta aac att gcc gac atc aaa   5468
Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys
          1575                1580                1585

aaa gac cca aat tca ggt tca tca tct aac cgc act gtc atc aaa gca   5516
Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala
      1590                1595                1600

ggc acg gta ctt ggc ggt aaa ggt aat aac gat acc gaa aaa ctt gcc   5564
Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala
  1605                1610                1615
```

FIG.2S

```
act ggt ggt ata caa gtg ggc gtg gat aaa gac ggc aac gct aac ggc   5612
Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly
1620                1625                1630                1635

gat tta agc aat gtt tgg gtc aaa acc caa aaa gat ggc agc aaa aaa   5660
Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys
                1640                1645                1650

gcc ctg ctc gcc act tat aac gcc gca ggt cag acc aac tat ttg acc   5708
Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr
            1655                1660                1665

aac aac ccc gca gaa gcc att gac aga ata aat gaa caa ggt atc cgc   5756
Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg
        1670                1675                1680

ttc ttc cat gtc aac gat ggc aat caa gag cct gtg gta caa ggg cgt   5804
Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg
    1685                1690                1695

aac ggc att gac tca agt gcc tca ggc aag cac tca gtg gcg ata ggt   5852
Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly
1700                1705                1710                1715
```

FIG.2T

```
ttc cag gcc aag gca gat ggt gaa gcc gcc gtt gcc ata ggc aga caa   5900
Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln
                1720                1725                1730

acc caa gca ggc aac caa tcc atc gcc atc ggt gat aac gca caa gcc   5948
Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala
            1735                1740                1745

acg ggc gat caa tcc atc gcc atc ggt aca ggc aat gtg gta gca ggt   5996
Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly
        1750                1755                1760

aag cac tct ggt gcc atc ggc gac cca agc act gtt aag gct gat aac   6044
Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn
    1765                1770                1775

agt tac agt gtg ggt aat aac aac cag ttt acc gat gcc act caa acc   6092
Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr
1780                1785                1790                1795

gat gtc ttt ggt gtg ggc aat aac atc acc gtg acc gaa agt aac tcg   6140
Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu Ser Asn Ser
                1800                1805                1810
```

FIG.2U

```
gtt gcc tta ggt tca aac tct gcc atc agt gca ggc aca cac gca ggc   6188
Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly
          1815                1820                1825

aca caa gcc aaa aaa tct gac ggc aca gca ggt aca acc acc aca gca   6236
Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala
       1830                1835                1840

ggt gca acc ggt acg gtt aaa ggc ttt gct gga caa acg gcg gtt ggt   6284
Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr Ala Val Gly
   1845                1850                1855

gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc cgt atc caa aat gtg   6332
Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile Gln Asn Val
1860                1865                1870                1875

gca gca ggt gag gtc agt gcc acc agc acc gat gcg gtc aat ggt agc   6380
Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser
               1880                1885                1890

cag ttg tac aaa gcc acc caa agc att gcc aac gca acc aat gag ctt   6428
Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu
          1895                1900                1905
```

FIG.2V

```
gac cat cgt atc cac caa aac gaa aat aag gcc aat gca ggg att tca   6476
Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser
      1910                1915                1920

tca gcg atg gcg atg gcg tcc atg cca caa gcc tac att cct ggc aga   6524
Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg
   1925                1930                1935

tcc atg gtt acc ggg ggt att gcc acc cac aac ggt caa ggt gcg gtg   6572
Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val
1940                1945                1950                1955

gca gtg gga ctg tcg aag ctg tcg gat aat ggt caa tgg gta ttt aaa   6620
Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys
               1960                1965                1970

atc aat ggt tca gcc gat acc caa ggc cat gta ggg gcg gca gtt ggt   6668
Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala Ala Val Gly
          1975                1980                1985

gca ggt ttt cac ttt taagccataa atcgcaagat tttacttaaa aatcaatctc   6723
Ala Gly Phe His Phe
      1990
```

FIG.2W

accatagttg tataaaacag catcagcatc agtcatatta ctgatgctga tgtttttat 6783

cacttaaacc attttaccgc tcaagtgatt ctctttcacc atgaccaaat cgccattgat 6843

cataggtaaa cttattgagt aaattttatc aatgtagttg ttagatatgg ttaaaattgt 6903

gccattgacc aaaaaatgac cgatttatcc cgaaaatttc tgattatgat ccgttgacct 6963

gcaggtcgac 6973

FIG.3A

M. catarrhalis strain 4223 genomic 200kDa gene.

```
ccatggatat gggcaggtgt gctcgcctgc cgtatgatgg cgatgacacc ccatttgccc 60

catatctgta cgatttgaca tgtgatatga tttaacatgt gacatgattt aacattgttt 120

aatactgttg ccatcattac cataatttag taacgcattt agtaacgcat ttgtaaaaat 180

cattgcgccc ctttatgtgt atcatatgaa tagaatatta tgattgtatc tgattattgt 240

atcagaatgg tgatgctata tgatgatgcc tacgagttga tttgggttaa tcactctatg 300

atttgatata ttttgaaact aatctattga cttaaatcac catatggtta taatttagca 360

taatggtagg ctttttgtaa aaatcacatc gcaatattgt tctactgtta ctaccatgct 420

tgaatgacga tcccaatcac cagattcatt caagtgatgt gtttgtatac gcaccattta 480

ccctaattat ttcaatcaaa tgcctatgtc agcatgtatc atttttttaa ggtaaaccac 540

c atg aat cac atc tat aaa gtc atc ttt aac aaa gcc aca ggc aca ttt 589
  Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe
    1               5                  10                  15
```

FIG.3B

```
atg gca gtg gca gag tac gcc aaa tcc cac agc acg ggg ggg ggt agc   637
Met Ala Val Ala Glu Tyr Ala Lys Ser His Ser Thr Gly Gly Gly Ser
             20                  25                  30

tgt gct aca ggg caa gtt ggc agt gta tgc act ctg agc ttt gcc cgt   685
Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg
        35                  40                  45

att gcc gcg ctc gct gtc ctc gtg atc ggt gca acg ctc agt ggc agt   733
Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Ser Gly Ser
    50                  55                  60

gct tat gct caa aaa aaa gat acc aaa cat atc gca att ggt gaa caa   781
Ala Tyr Ala Gln Lys Lys Asp Thr Lys His Ile Ala Ile Gly Glu Gln
65                  70                  75                  80

aac cag cca aga cgc tca ggc act gcc aag gcg gac ggt gat cga gcc   829
Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys Ala Asp Gly Asp Arg Ala
                85                  90                  95

att gct att ggt gaa aat gct aac gca cag ggc ggt caa gcc atc gcc   877
Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln Gly Gly Gln Ala Ile Ala
            100                 105                 110
```

FIG.3C

```
atc ggt agt agt aat aaa act gtc aat gga agc agt ttg gat aag ata   925
Ile Gly Ser Ser Asn Lys Thr Val Asn Gly Ser Ser Leu Asp Lys Ile
        115                 120                 125

ggt acc gat gct acg ggt caa gag tcc atc gcc atc ggt ggt gat gta   973
Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile Ala Ile Gly Gly Asp Val
    130                 135                 140

aag gct agt ggt gat gcc tcg att gcc atc ggt agt gat gac tta cat   1021
Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu His
145                 150                 155                 160

ttg ctt gat cag cat ggt aat cct aaa cat ccg aaa ggt act ctg att   1069
Leu Leu Asp Gln His Gly Asn Pro Lys His Pro Lys Gly Thr Leu Ile
                165                 170                 175

aac gat ctt att aac ggc cat gca gta tta aaa gaa ata cga agc tca   1117
Asn Asp Leu Ile Asn Gly His Ala Val Leu Lys Glu Ile Arg Ser Ser
            180                 185                 190

aag gat aat gat gta aaa tat aga cgc aca acc gca agc gga cac gcc   1165
Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr Thr Ala Ser Gly His Ala
        195                 200                 205
```

FIG.3D

```
agt act gca gtg gga gcc atg tca tat gca cag ggt cat ttt tcc aac   1213
Ser Thr Ala Val Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn
    210                 215                 220

gcc ttt ggt aca cgg gca aca gct aaa agt gcc tat tcc ttg gca gtg   1261
Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser Ala Tyr Ser Leu Ala Val
225                 230                 235                 240

ggt ctt gcc gcc aca gcc gag ggc caa tct aca atc gct att ggt tct   1309
Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser Thr Ile Ala Ile Gly Ser
                245                 250                 255

gat gca aca tct agc tcg ttg gga gcg ata gcc ctt ggt gca ggt act   1357
Asp Ala Thr Ser Ser Ser Leu Gly Ala Ile Ala Leu Gly Ala Gly Thr
            260                 265                 270

cgt gct cag cta cag ggc agt att gcc cta ggt caa ggt tct gtt gtc   1405
Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu Gly Gln Gly Ser Val Val
        275                 280                 285

act cag agt gat aat aat tct aga ccg gcc tat aca cca aat acc cag   1453
Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala Tyr Thr Pro Asn Thr Gln
    290                 295                 300
```

FIG.3E

```
gca cta gac ccc aag ttt caa gcc acc aat aat acg aag gcg ggt cca   1501
Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn Asn Thr Lys Ala Gly Pro
305                 310                 315                 320

ctt tcc att ggt agt aac tct atc aaa cgt aaa atc atc aat gtc ggt   1549
Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg Lys Ile Ile Asn Val Gly
                325                 330                 335

gca ggt gtt aat aaa acc gat gcg gtc aat gtg gca cag cta gaa gcg   1597
Ala Gly Val Asn Lys Thr Asp Ala Val Asn Val Ala Gln Leu Glu Ala
            340                 345                 350

gtg gtg aag tgg gct aag gag cgt aga att act ttt cag ggt gat gat   1645
Val Val Lys Trp Ala Lys Glu Arg Arg Ile Thr Phe Gln Gly Asp Asp
        355                 360                 365

aac agt act gac gta aaa ata ggt ttg gat aat act tta act att aaa   1693
Asn Ser Thr Asp Val Lys Ile Gly Leu Asp Asn Thr Leu Thr Ile Lys
    370                 375                 380

ggt ggt gca gag acc aac gca tta acc gat aat aat atc ggt gtg gta   1741
Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp Asn Asn Ile Gly Val Val
385                 390                 395                 400
```

FIG.3F

```
aaa gag gct gat aat agt ggt ctg aaa gtt aaa ctt gct aaa act tta   1789
Lys Glu Ala Asp Asn Ser Gly Leu Lys Val Lys Leu Ala Lys Thr Leu
                405                 410                 415

aac aat ctt act gag gtg aat aca act aca tta aat gcc aca acc aca   1837
Asn Asn Leu Thr Glu Val Asn Thr Thr Thr Leu Asn Ala Thr Thr Thr
            420                 425                 430

gtt aag gta ggt agt agt agt agt act aca gct gaa tta ttg agt gat   1885
Val Lys Val Gly Ser Ser Ser Ser Thr Thr Ala Glu Leu Leu Ser Asp
        435                 440                 445

agt tta acc ttt acc cag ccc aat aca ggc agt caa agc aca agc aaa   1933
Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly Ser Gln Ser Thr Ser Lys
    450                 455                 460

acc gtc tat ggc gtt aat ggg gtg aag ttt act aat aat gca gaa aca   1981
Thr Val Tyr Gly Val Asn Gly Val Lys Phe Thr Asn Asn Ala Glu Thr
465                 470                 475                 480

aca gca gca atc ggc act act cgt att acc aga gat aaa att ggc ttt   2029
Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr Arg Asp Lys Ile Gly Phe
                485                 490                 495
```

FIG.3G

```
gct cga gat ggt gat gtt gat gaa aaa caa gca cca tat ttg gat aaa   2077
Ala Arg Asp Gly Asp Val Asp Glu Lys Gln Ala Pro Tyr Leu Asp Lys
            500                 505                 510

aaa caa ctt aaa gtg ggt agt gtt gca att acc ata gac aat ggc att   2125
Lys Gln Leu Lys Val Gly Ser Val Ala Ile Thr Ile Asp Asn Gly Ile
        515                 520                 525

gat gca ggt aat aaa aag atc agt aat ctt gcc aaa ggt agc agt gct   2173
Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu Ala Lys Gly Ser Ser Ala
    530                 535                 540

aac gat gcg gtt acc atc gaa cag ctc aaa gcc gcc aag cct act tta   2221
Asn Asp Ala Val Thr Ile Glu Gln Leu Lys Ala Ala Lys Pro Thr Leu
545                 550                 555                 560

aac gca ggc gct ggc atc agt gtc aca cct act gaa ata tca gtt gat   2269
Asn Ala Gly Ala Gly Ile Ser Val Thr Pro Thr Glu Ile Ser Val Asp
                565                 570                 575

gct aag agt ggc aat gtt acc gcc cca act tac aac att ggc gtg aaa   2317
Ala Lys Ser Gly Asn Val Thr Ala Pro Thr Tyr Asn Ile Gly Val Lys
            580                 585                 590
```

FIG.3H

```
acc acc gag ctt aac agt gat ggc act agt gat aaa ttt agt gtt aag   2365
Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser Asp Lys Phe Ser Val Lys
        595                 600                 605

ggt agt ggt acg aac aat agc tta gtt acc gcc gaa cat ttg gca agc   2413
Gly Ser Gly Thr Asn Asn Ser Leu Val Thr Ala Glu His Leu Ala Ser
    610                 615                 620

tat cta aat gaa gtc aat cga acg gct gac agt gct cta caa agc ttt   2461
Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp Ser Ala Leu Gln Ser Phe
625                 630                 635                 640

acc gtt aaa gaa gaa gac gat gat gac gcc aac gct atc acc gtg gct   2509
Thr Val Lys Glu Glu Asp Asp Asp Asp Ala Asn Ala Ile Thr Val Ala
                645                 650                 655

aaa gat acg aca aaa aat gcc ggc gca gtc agc atc tta aaa ctc aaa   2557
Lys Asp Thr Thr Lys Asn Ala Gly Ala Val Ser Ile Leu Lys Leu Lys
            660                 665                 670

ggt aaa aac ggt cta acg gtt gct acc aaa aaa gat ggt acg gtt acc   2605
Gly Lys Asn Gly Leu Thr Val Ala Thr Lys Lys Asp Gly Thr Val Thr
        675                 680                 685
```

FIG.3I

```
ttt ggg ctt agc caa gat agc ggt ctg acc att ggc aaa agc acc cta   2653
Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr Ile Gly Lys Ser Thr Leu
    690                 695                 700

aac aac gat ggc ttg act gtt aaa gat acc aac gaa caa atc caa gtc   2701
Asn Asn Asp Gly Leu Thr Val Lys Asp Thr Asn Glu Gln Ile Gln Val
705                 710                 715                 720

ggt gct aat ggc att aaa ttt act aat gtg aat ggt agt aat cca ggt   2749
Gly Ala Asn Gly Ile Lys Phe Thr Asn Val Asn Gly Ser Asn Pro Gly
                725                 730                 735

act ggc att gca aat acc gct cgc att acc aga gat aaa att ggc ttt   2797
Thr Gly Ile Ala Asn Thr Ala Arg Ile Thr Arg Asp Lys Ile Gly Phe
            740                 745                 750

gct ggt tct gat ggt gca gtt gat aca aac aaa cct tat ctt gat caa   2845
Ala Gly Ser Asp Gly Ala Val Asp Thr Asn Lys Pro Tyr Leu Asp Gln
        755                 760                 765

gac aag cta caa gtt ggc aat gtt aag att acc aac act ggc att aac   2893
Asp Lys Leu Gln Val Gly Asn Val Lys Ile Thr Asn Thr Gly Ile Asn
    770                 775                 780
```

FIG.3J

```
gca ggt ggt aaa gcc atc aca ggg ctg tcc cca aca ctg cct agc att   2941
Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser Pro Thr Leu Pro Ser Ile
785                 790                 795                 800

gcc gat caa agt agc cgc aac ata gaa ctg ggc aat aca atc caa gac   2989
Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu Gly Asn Thr Ile Gln Asp
                805                 810                 815

aaa gac aaa tcc aac gct gcc agc att aat gat ata tta aat aca ggc   3037
Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn Asp Ile Leu Asn Thr Gly
            820                 825                 830

ttt aac cta aaa aat aat aac aac ccc att gac ttt gtc tcc act tat   3085
Phe Asn Leu Lys Asn Asn Asn Asn Pro Ile Asp Phe Val Ser Thr Tyr
        835                 840                 845

gac att gtt gac ttt gcc aat ggc aat gcc acc acc gcc aca gta acc   3133
Asp Ile Val Asp Phe Ala Asn Gly Asn Ala Thr Thr Ala Thr Val Thr
    850                 855                 860

cat gat acc gct aac aaa acc agt aaa gtg gta tat gat gtg aat gtg   3181
His Asp Thr Ala Asn Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val
865                 870                 875                 880
```

FIG.3K

```
gat gat aca acc att cat cta aca ggc act gat gac aat aaa aaa ctt   3229
Asp Asp Thr Thr Ile His Leu Thr Gly Thr Asp Asp Asn Lys Lys Leu
                885                 890                 895

ggc gtc aaa acc acc aaa ctg aac aaa aca agt gct aat ggt aat aca   3277
Gly Val Lys Thr Thr Lys Leu Asn Lys Thr Ser Ala Asn Gly Asn Thr
            900                 905                 910

gca act aac ttt aat gtt aac tct agt gat gaa gat gcc ctt gtt aac   3325
Ala Thr Asn Phe Asn Val Asn Ser Ser Asp Glu Asp Ala Leu Val Asn
        915                 920                 925

gcc aaa gac atc gcc gaa aat cta aac acc cta gcc aag gaa att cac   3373
Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His
    930                 935                 940

acc acc aaa ggc aca gca gac acc gcc cta caa acc ttt acc gtt aaa   3421
Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Thr Val Lys
945                 950                 955                 960

aag gta gat gaa aat aat aat gct gat gac gcc aac gcc atc acc gtg   3469
Lys Val Asp Glu Asn Asn Asn Ala Asp Asp Ala Asn Ala Ile Thr Val
                965                 970                 975
```

FIG.3L

```
ggt caa aag aac gca aat aat caa gtc aac acc cta aca ctc aaa ggt   3517
Gly Gln Lys Asn Ala Asn Asn Gln Val Asn Thr Leu Thr Leu Lys Gly
            980                 985                 990

gaa aac ggt ctt aat att aaa acc gac aaa aat ggt acg gtt acc ttt   3565
Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys Asn Gly Thr Val Thr Phe
        995                1000                1005

ggc att aac acc aca agc ggt ctt aaa gcc ggc aaa agc acc cta aac   3613
Gly Ile Asn Thr Thr Ser Gly Leu Lys Ala Gly Lys Ser Thr Leu Asn
   1010                1015                1020

gac ggt ggc ttg tct att aaa aac ccc act ggt agc gaa caa atc caa   3661
Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly Ser Glu Gln Ile Gln
1025                1030                1035                1040

gtc ggt gct gat ggc gtg aag ttt gcc aag gtt aat aat aat ggt gtt   3709
Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val Asn Asn Asn Gly Val
                1045                1050                1055

gta ggt gct ggc att gat ggc aca act cgc att acc aga gat gaa att   3757
Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile Thr Arg Asp Glu Ile
            1060                1065                1070
```

FIG.3M

```
ggc ttt act ggg act aat ggc tca ctt gat aaa agc aaa ccc cac cta   3805
Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys Ser Lys Pro His Leu
      1075                1080                1085

agc aaa gac ggc att aac gca ggt ggt aaa aag att acc aac att caa   3853
Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys Ile Thr Asn Ile Gln
   1090                1095                1100

tca ggt gag att gcc caa aac agc cat gat gct gtg aca ggc ggc aag   3901
Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala Val Thr Gly Gly Lys
1105                1110                1115                1120

att tat gat tta aaa acc gaa ctt gaa aac aaa atc agc agt act gcc   3949
Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys Ile Ser Ser Thr Ala
                1125                1130                1135

aaa aca gca caa aac tca tta cac gaa ttc tca gta gca gat gaa caa   3997
Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser Val Ala Asp Glu Gln
          1140                1145                1150

ggt aat aac ttt acg gtt agt aac cct tac tcc agt tat gac acc tca   4045
Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser Ser Tyr Asp Thr Ser
      1155                1160                1165
```

FIG.3N

```
aag acc tct gat gtc atc acc ttt gca ggt gaa aac ggc att acc acc   4093
Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu Asn Gly Ile Thr Thr
  1170                1175                1180

aag gta aat aaa ggt gtg gtg cgt gtg ggc att gac caa acc aaa ggc   4141
Lys Val Asn Lys Gly Val Val Arg Val Gly Ile Asp Gln Thr Lys Gly
1185                1190                1195                1200

tta acc acg cct aag ctg acc gtg ggt aat aat aat ggc aaa ggc att   4189
Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn Asn Gly Lys Gly Ile
                1205                1210                1215

gtc att gac agc caa aat ggt caa aat acc atc aca gga cta agc aac   4237
Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile Thr Gly Leu Ser Asn
          1220                1225                1230

act cta gct aat gtt acc aat gat aaa ggt agc gta cgc acc aca gaa   4285
Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser Val Arg Thr Thr Glu
      1235                1240                1245

cag ggc aat ata atc aaa gac gaa gac aaa acc cgt gcc gcc agc att   4333
Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr Arg Ala Ala Ser Ile
  1250                1255                1260
```

FIG.3O

```
gtt gat gtg cta agc gca ggc ttt aac ttg caa ggc aat ggt gaa gcg   4381
Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln Gly Asn Gly Glu Ala
1265                1270                1275                1280

gtt gac ttt gtc tcc act tat gac acc gtc aac ttt gcc gat ggc aat   4429
Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn Phe Ala Asp Gly Asn
                1285                1290                1295

gcc acc acc gct aag gtg acc tat gat gac aca agc aaa acc agt aaa   4477
Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr Ser Lys Thr Ser Lys
            1300                1305                1310

gtg gtc tat gat gtc aat gtg gat gat aca acc att gaa gtt aaa gat   4525
Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile Glu Val Lys Asp
        1315                1320                1325

aaa aaa ctt ggc gta aaa acc acc aca ttg acc agt act ggc aca ggt   4573
Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr Ser Thr Gly Thr Gly
    1330                1335                1340

gct aat aaa ttt gcc cta agc aat caa gct act ggc gat gcg ctt gtc   4621
Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr Gly Asp Ala Leu Val
1345                1350                1355                1360
```

FIG.3P

```
aag gcc agt gat atc gtt gct cat cta aac acc tta tct ggc gac atc   4669
Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr Leu Ser Gly Asp Ile
                1365                1370                1375

caa act gcc aaa ggg gca agc caa gcg aac aac tca gca ggc tat gtg   4717
Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn Ser Ala Gly Tyr Val
        1380                1385                1390

gat gct gat ggc aat aag gtc atc tat gac agt acc gat aac aag tac   4765
Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser Thr Asp Asn Lys Tyr
    1395                1400                1405

tat caa gcc aaa aat gat ggc aca gtt gat aaa acc aaa gaa gtt gcc   4813
Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys Thr Lys Glu Val Ala
1410                1415                1420

aaa gac aaa ctg gtc gcc caa gcc caa acc cca gat ggc aca ttg gct   4861
Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro Asp Gly Thr Leu Ala
1425                1430                1435                1440

caa atg aat gtc aaa tca gtc att aac aaa gaa caa gta aat gat gcc   4909
Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu Gln Val Asn Asp Ala
                1445                1450                1455
```

FIG.3Q

```
aat aaa aag caa ggc atc aat gaa gac aac gcc ttt gtt aaa gga ctt   4957
Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala Phe Val Lys Gly Leu
          1460                1465                1470

gaa aaa gcc gct tct gat aac aaa acc aaa aac gcc gca gta act gtg   5005
Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn Ala Ala Val Thr Val
      1475                1480                1485

ggt gat tta aat gcc gtt gcc caa aca ccg ctg acc ttt gca ggg gat   5053
Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu Thr Phe Ala Gly Asp
  1490                1495                1500

aca ggc aca acg gct aaa aaa ctg ggc gag act ttg acc atc aaa ggt   5101
Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr Leu Thr Ile Lys Gly
1505                1510                1515                1520

ggg caa aca gac acc aat aag cta acc gat aat aac atc ggt gtg gta   5149
Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn Asn Ile Gly Val Val
                1525                1530                1535

gca ggt act gat ggc ttc act gtc aaa ctt gcc aaa gac cta acc aat   5197
Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala Lys Asp Leu Thr Asn
          1540                1545                1550
```

FIG.3R

```
ctt aac agc gtt aat gca ggt ggc acc aaa att gat gac aaa ggc gtg   5245
Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile Asp Asp Lys Gly Val
      1555                1560                1565

tct ttt gta gac tca agc ggt caa gcc aaa gca aac acc cct gtg cta   5293
Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala Asn Thr Pro Val Leu
   1570                1575                1580

agt gcc aat ggg ctg gac ctg ggt ggc aag gtc atc agt aat gtg ggc   5341
Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val Ile Ser Asn Val Gly
1585                1590                1595                1600

aaa ggc aca aaa gat acc gac gct gcc aat gta caa cag tta aac gaa   5389
Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu
                1605                1610                1615

gta cgc aac ttg ttg ggt ctt ggt aat gct ggt aat gat aac gct gac   5437
Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly Asn Asp Asn Ala Asp
          1620                1625                1630

ggc aat cag gta aac att gcc gac atc aaa aaa gac cca aat tca ggt   5485
Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly
      1635                1640                1645
```

FIG.3S

```
tca tca tct aac cgc act gtc atc aaa gca ggc acg gta ctt ggc ggt   5533
Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly
   1650                1655                1660

aaa ggt aat aac gat acc gaa aaa ctt gcc act ggt ggt ata caa gtg   5581
Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr Gly Gly Ile Gln Val
1665                1670                1675                1680

ggc gtg gat aaa gac ggc aac gct aac ggc gat tta agc aat gtt tgg   5629
Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp
                1685                1690                1695

gtc aaa acc caa aaa gat ggc agc aaa aaa gcc ctg ctc gcc act tat   5677
Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr
            1700                1705                1710

aac gcc gca ggt cag acc aac tat ttg acc aac aac ccc gca gaa gcc   5725
Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala
        1715                1720                1725

att gac aga ata aat gaa caa ggt atc cgc ttc ttc cat gtc aac gat   5773
Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp
    1730                1735                1740
```

FIG.3T

```
ggc aat caa gag cct gtg gta caa ggg cgt aac ggc att gac tca agt   5821
Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser
1745                1750                1755                1760

gcc tca ggc aag cac tca gtg gcg ata ggt ttc cag gcc aag gca gat   5869
Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe Gln Ala Lys Ala Asp
                1765                1770                1775

ggt gaa gcc gcc gtt gcc ata ggc aga caa acc caa gca ggc aac caa   5917
Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr Gln Ala Gly Asn Gln
          1780                1785                1790

tcc atc gcc atc ggt gat aac gca caa gcc acg ggc gat caa tcc atc   5965
Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala Thr Gly Asp Gln Ser Ile
      1795                1800                1805

gcc atc ggt aca ggc aat gtg gta gca ggt aag cac tct ggt gcc atc   6013
Ala Ile Gly Thr Gly Asn Val Val Ala Gly Lys His Ser Gly Ala Ile
  1810                1815                1820

ggc gac cca agc act gtt aag gct gat aac agt tac agt gtg ggt aat   6061
Gly Asp Pro Ser Thr Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn
1825                1830                1835                1840
```

FIG.3U

```
aac aac cag ttt acc gat gcc act caa acc gat gtc ttt ggt gtg ggc   6109
Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly
                1845                1850                1855

aat aac atc acc gtg acc gaa agt aac tcg gtt gcc tta ggt tca aac   6157
Asn Asn Ile Thr Val Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn
            1860                1865                1870

tct gcc atc agt gca ggc aca cac gca ggc aca caa gcc aaa aaa tct   6205
Ser Ala Ile Ser Ala Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser
        1875                1880                1885

gac ggc aca gca ggt aca acc acc aca gca ggt gca acc ggt acg gtt   6253
Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala Gly Ala Thr Gly Thr Val
    1890                1895                1900

aaa ggc ttt gct gga caa acg gcg gtt ggt gcg gtc tcc gtg ggt gcc   6301
Lys Gly Phe Ala Gly Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala
1905                1910                1915                1920

tca ggt gct gaa cgc cgt atc caa aat gtg gca gca ggt gag gtc agt   6349
Ser Gly Ala Glu Arg Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser
                1925                1930                1935
```

FIG.3V

```
gcc acc agc acc gat gcg gtc aat ggt agc cag ttg tac aaa gcc acc   6397
Ala Thr Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr
          1940                1945                1950

caa agc att gcc aac gca acc aat gag ctt gac cat cgt atc cac caa   6445
Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu Asp His Arg Ile His Gln
      1955                1960                1965

aac gaa aat aag gcc aat gca ggg att tca tca gcg atg gcg atg gcg   6493
Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala
   1970                1975                1980

tcc atg cca caa gcc tac att cct ggc aga tcc atg gtt acc ggg ggt   6541
Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Gly
1985                1990                1995                2000

att gcc acc cac aac ggt caa ggt gcg gtg gca gtg gga ctg tcg aag   6589
Ile Ala Thr His Asn Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys
               2005                2010                2015

ctg tcg gat aat ggt caa tgg gta ttt aaa atc aat ggt tca gcc gat   6637
Leu Ser Asp Asn Gly Gln Trp Val Phe Lys Ile Asn Gly Ser Ala Asp
          2020                2025                2030
```

FIG.3W

acc caa ggc cat gta ggg gcg gca gtt ggt gca ggt ttt cac ttt 6682
Thr Gln Gly His Val Gly Ala Ala Val Gly Ala Gly Phe His Phe
2035 2040 2045

taagccataa atcgcaagat tttacttaaa aatcaatctc accatagttg tataaaacag 6742

catcagcatc agtcatatta ctgatgctga tgtttttttat cacttaaacc attttaccgc 6802

tcaagtgatt ctctttcacc atgaccaaat cgccattgat cataggtaaa cttattgagt 6862

aaattttatc aatgtagttg ttagatatgg ttaaaattgt gccattgacc aaaaaatgac 6922

cgatttatcc cgaaaatttc tgattatgat ccgttgacct gcaggtcgac 6972

FIG.4A

M. catarrhalis strain Q8 200kDa gene

```
ATG aat cac atc tat aaa gtc atc ttt aac aaa gcc aca ggc aca ttt    48
Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe
 1               5                  10                  15

atg gcc gtg gcg gaa tat gcc aaa tcc cac agt acg ggg ggg ggt agc    96
Met Ala Val Ala Glu Tyr Ala Lys Ser His Ser Thr Gly Gly Gly Ser
            20                  25                  30

tgt gct aca ggg caa gtt ggc agt gta cgc act cta agc ttt gcc cgt   144
Cys Ala Thr Gly Gln Val Gly Ser Val Arg Thr Leu Ser Phe Ala Arg
        35                  40                  45

att gcc gcg ctc gct gtc ctc gtg atc ggt gcg acg ctc aat ggc agt   192
Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Asn Gly Ser
    50                  55                  60

gct tat gct caa caa att act acc aag atc gaa att ggt caa aca aac   240
Ala Tyr Ala Gln Gln Ile Thr Thr Lys Ile Glu Ile Gly Gln Thr Asn
65                  70                  75                  80

aag ata aac aac acg ctg aaa ggc gat gcc cta gcg aca ggt gaa gca   288
Lys Ile Asn Asn Thr Leu Lys Gly Asp Ala Leu Ala Thr Gly Glu Ala
                85                  90                  95
```

FIG.4B

```
tcc att gct ttt ggt agt ctt tct aag gca caa ggc tct caa gct att   336
Ser Ile Ala Phe Gly Ser Leu Ser Lys Ala Gln Gly Ser Gln Ala Ile
            100                 105                 110

gct atc ggt agt gtc aaa cca gat cct aat aat ggt agt aat ggt aat   384
Ala Ile Gly Ser Val Lys Pro Asp Pro Asn Asn Gly Ser Asn Gly Asn
        115                 120                 125

gta ggt tcc cac gcc aaa ggt aac gag tcc atc gcc atc ggt ggt gat   432
Val Gly Ser His Ala Lys Gly Asn Glu Ser Ile Ala Ile Gly Gly Asp
    130                 135                 140

gta ttg gct gag ggt gat gcc tcg att gcc atc ggt agt gat gac tta   480
Val Leu Ala Glu Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu
145                 150                 155                 160

tat ttg cct aag aat ctt gat ctg aag aat gaa ttt cac aaa ctt att   528
Tyr Leu Pro Lys Asn Leu Asp Leu Lys Asn Glu Phe His Lys Leu Ile
                165                 170                 175

cat ggc cat gaa ata tta aaa aaa ata caa acc tca acc gat ggt aaa   576
His Gly His Glu Ile Leu Lys Lys Ile Gln Thr Ser Thr Asp Gly Lys
            180                 185                 190
```

FIG.4C

```
atc aaa tat cga cgc aca aga gca caa ggg cac gcc agt act gca gtg   624
Ile Lys Tyr Arg Arg Thr Arg Ala Gln Gly His Ala Ser Thr Ala Val
        195                 200                 205

gga gcc atg tca tat gca cag ggt cat ttt tcc aac gcc ttt ggt aca   672
Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr
    210                 215                 220

tac gca aca gct gaa gct gcc tat tcc ttg gca gta ggt ctt gcc gcc   720
Tyr Ala Thr Ala Glu Ala Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala
225                 230                 235                 240

caa gcc aca aaa caa tct tca atc gct gtt ggt tcc aat gca aaa gct   768
Gln Ala Thr Lys Gln Ser Ser Ile Ala Val Gly Ser Asn Ala Lys Ala
                245                 250                 255

aac gcg ttt gca gcg aca gcc att ggt gga aat act gta gtt aat ttg   816
Asn Ala Phe Ala Ala Thr Ala Ile Gly Gly Asn Thr Val Val Asn Leu
            260                 265                 270

ggt cga ggc gtt gcc cta ggt ttt ggt tct cag atc ctt gat agg gat   864
Gly Arg Gly Val Ala Leu Gly Phe Gly Ser Gln Ile Leu Asp Arg Asp
        275                 280                 285
```

FIG.4D

```
aat aat aca gat gcc agt gcc tat gta cca cta ggt aaa acg tta gca   912
Asn Asn Thr Asp Ala Ser Ala Tyr Val Pro Leu Gly Lys Thr Leu Ala
    290                 295                 300

gac cag tat aaa gcc acc cgc cag ggt gat tct acg gat ata ttt tcc   960
Asp Gln Tyr Lys Ala Thr Arg Gln Gly Asp Ser Thr Asp Ile Phe Ser
305                 310                 315                 320

att ggt aat agt aat aat aat aat agc agt atc agg cgt aaa atc atc   1008
Ile Gly Asn Ser Asn Asn Asn Asn Ser Ser Ile Arg Arg Lys Ile Ile
                325                 330                 335

aat gtc ggt gcg ggt tct cgg gat acc gat gcg gtc aat gtg gca cag   1056
Asn Val Gly Ala Gly Ser Arg Asp Thr Asp Ala Val Asn Val Ala Gln
            340                 345                 350

ctt aaa ttg gtg gag gaa ctg gct aat cgt aaa att act ttt aag ggt   1104
Leu Lys Leu Val Glu Glu Leu Ala Asn Arg Lys Ile Thr Phe Lys Gly
        355                 360                 365

gat ggt gac aat aat agc aat agc gta gaa aga ggt ttg ggc aat act   1152
Asp Gly Asp Asn Asn Ser Asn Ser Val Glu Arg Gly Leu Gly Asn Thr
    370                 375                 380
```

FIG.4E

```
tta act att aaa ggt gat gca cag acc aac gca tta acc gaa gct aac   1200
Leu Thr Ile Lys Gly Asp Ala Gln Thr Asn Ala Leu Thr Glu Ala Asn
385                 390                 395                 400

atc ggt gtg gta aca gat ggc aat ggt ctg aaa gtt aaa ctt gct aaa   1248
Ile Gly Val Val Thr Asp Gly Asn Gly Leu Lys Val Lys Leu Ala Lys
                405                 410                 415

gag ctg act gga ttg acc agt gtc tcc gct acc aac aaa atc acc gtt   1296
Glu Leu Thr Gly Leu Thr Ser Val Ser Ala Thr Asn Lys Ile Thr Val
            420                 425                 430

agt aat acc aac aac aac aac gcc gag cta caa agc ggt ggt ttg acc   1344
Ser Asn Thr Asn Asn Asn Asn Ala Glu Leu Gln Ser Gly Gly Leu Thr
        435                 440                 445

ttt agc cca ata aca ggt aca aaa aca gat aaa acc gtc tac agc att   1392
Phe Ser Pro Ile Thr Gly Thr Lys Thr Asp Lys Thr Val Tyr Ser Ile
    450                 455                 460

gat gga ttg aag ttt act aat gat agt aat agt ata gca act aaa ggt   1440
Asp Gly Leu Lys Phe Thr Asn Asp Ser Asn Ser Ile Ala Thr Lys Gly
465                 470                 475                 480
```

FIG.4F

```
act act cgt att acc aaa aag aaa att ggt ttt gct ggt act aat gat   1488
Thr Thr Arg Ile Thr Lys Lys Lys Ile Gly Phe Ala Gly Thr Asn Asp
                485                 490                 495

gga gtt gat gaa agc aaa cct tat ctt gac aac gaa aag cta aaa gtt   1536
Gly Val Asp Glu Ser Lys Pro Tyr Leu Asp Asn Glu Lys Leu Lys Val
            500                 505                 510

ggc aac agc acc cta aac agt ggt agc ttg act gtt aat aac acc act   1584
Gly Asn Ser Thr Leu Asn Ser Gly Ser Leu Thr Val Asn Asn Thr Thr
        515                 520                 525

ggt aat aaa caa atc caa gtc ggt gct aat ggc att aaa ttt gcc aca   1632
Gly Asn Lys Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe Ala Thr
    530                 535                 540

gtc gct aat aat gtt gca aat acc tca gca aca gtc ggc act gct cgt   1680
Val Ala Asn Asn Val Ala Asn Thr Ser Ala Thr Val Gly Thr Ala Arg
545                 550                 555                 560

att acc gaa gag aaa att ggt ttt gct ggt act aat gat gga gtt gat   1728
Ile Thr Glu Glu Lys Ile Gly Phe Ala Gly Thr Asn Asp Gly Val Asp
                565                 570                 575
```

FIG.4G

```
gaa caa gca cca tat ttg gat aaa gaa cga ctt aaa gtg ggt cgt gtt   1776
Glu Gln Ala Pro Tyr Leu Asp Lys Glu Arg Leu Lys Val Gly Arg Val
            580                 585                 590

gaa att acc aca gat agt ggt att aat gct ggt aat cac aag att acc   1824
Glu Ile Thr Thr Asp Ser Gly Ile Asn Ala Gly Asn His Lys Ile Thr
        595                 600                 605

gga ctt act aat ggt ata gca aat acc gat gcg gtt acc atc aaa cag   1872
Gly Leu Thr Asn Gly Ile Ala Asn Thr Asp Ala Val Thr Ile Lys Gln
    610                 615                 620

ctc aaa gac gcc aag cct act tta aac gca ggc gat ggc atc agt att   1920
Leu Lys Asp Ala Lys Pro Thr Leu Asn Ala Gly Asp Gly Ile Ser Ile
625                 630                 635                 640

aat agt aat aac ggg gat cta gtt gat agt agt ggc aat att acc acc   1968
Asn Ser Asn Asn Gly Asp Leu Val Asp Ser Ser Gly Asn Ile Thr Thr
                645                 650                 655

cca act tat aac att agc gtg aaa acc act aag ctt aac agt aat ggc   2016
Pro Thr Tyr Asn Ile Ser Val Lys Thr Thr Lys Leu Asn Ser Asn Gly
            660                 665                 670
```

FIG.4H

```
acc agt ggt aat aat aaa ttt agt gtt agt aat gct cat gat aac aat   2064
Thr Ser Gly Asn Asn Lys Phe Ser Val Ser Asn Ala His Asp Asn Asn
        675                 680                 685

agc tta gtt acc gcc aaa gat ttg gca gac tat cta aat aaa gtc aat   2112
Ser Leu Val Thr Ala Lys Asp Leu Ala Asp Tyr Leu Asn Lys Val Asn
    690                 695                 700

gaa acg gct gac agt gct cta cca agc ttt aaa gtc caa aac ggt gat   2160
Glu Thr Ala Asp Ser Ala Leu Pro Ser Phe Lys Val Gln Asn Gly Asp
705                 710                 715                 720

aat agc aac aac gcc atc acc gtg ggt aaa gat aca aac ggc aag acc   2208
Asn Ser Asn Asn Ala Ile Thr Val Gly Lys Asp Thr Asn Gly Lys Thr
                725                 730                 735

ttc aac acc tta aaa ctc aaa ggt gaa aac ggt gtt aat att acg acc   2256
Phe Asn Thr Leu Lys Leu Lys Gly Glu Asn Gly Val Asn Ile Thr Thr
            740                 745                 750

aat aga gcc aca ggt aca gtt acc ttt ggc att gac caa agt aat ggt   2304
Asn Arg Ala Thr Gly Thr Val Thr Phe Gly Ile Asp Gln Ser Asn Gly
        755                 760                 765
```

FIG.4I

```
ctc acc acg cct aag ctg acc gtg ggt agc gat aca aat ggt aat cga   2352
Leu Thr Thr Pro Lys Leu Thr Val Gly Ser Asp Thr Asn Gly Asn Arg
    770                 775                 780

ttg gtt att gag caa gtc cct agc gct gac ggt aac agc acc aaa aac   2400
Leu Val Ile Glu Gln Val Pro Ser Ala Asp Gly Asn Ser Thr Lys Asn
785                 790                 795                 800

atc att aaa gga ttg tcc cca aca ctg cct agc att gcc agt cca agt   2448
Ile Ile Lys Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Ser Pro Ser
                805                 810                 815

ggc cgc aac ata gca ctg ggc aat aca atc gaa gaa aaa gac aaa tcc   2496
Gly Arg Asn Ile Ala Leu Gly Asn Thr Ile Glu Glu Lys Asp Lys Ser
            820                 825                 830

aac gct gcc agc att gat gat gtg cta aat gca ggc ttt aac cta aaa   2544
Asn Ala Ala Ser Ile Asp Asp Val Leu Asn Ala Gly Phe Asn Leu Lys
        835                 840                 845

aat aat ggc aaa gac aaa gac ttt gtc tcc act tat gac act gtt gac   2592
Asn Asn Gly Lys Asp Lys Asp Phe Val Ser Thr Tyr Asp Thr Val Asp
    850                 855                 860
```

FIG.4J

```
ttt atc gat ggc aat gcc acc acc gcc aca gta act tat gat gaa gcc   2640
Phe Ile Asp Gly Asn Ala Thr Thr Ala Thr Val Thr Tyr Asp Glu Ala
865                 870                 875                 880

aat caa acc agt aaa gtg gcg tat gat gtg aat gtg gat gag aaa acc   2688
Asn Gln Thr Ser Lys Val Ala Tyr Asp Val Asn Val Asp Glu Lys Thr
                885                 890                 895

att gaa ctg aca ggc gat aat ggc aag aaa caa ctt ggc gtc aaa acc   2736
Ile Glu Leu Thr Gly Asp Asn Gly Lys Lys Gln Leu Gly Val Lys Thr
            900                 905                 910

atc aaa ctg acc gaa aca agt act aat ggt aat gca act aca ttt agt   2784
Ile Lys Leu Thr Glu Thr Ser Thr Asn Gly Asn Ala Thr Thr Phe Ser
        915                 920                 925

acc gac gat gac cat gcc ctt gtt aaa gcc agt gat atc gcc ggc aat   2832
Thr Asp Asp Asp His Ala Leu Val Lys Ala Ser Asp Ile Ala Gly Asn
    930                 935                 940

cta aac acc cta gcc gag gaa att cac acc acc aaa ggc aca gca aac   2880
Leu Asn Thr Leu Ala Glu Glu Ile His Thr Thr Lys Gly Thr Ala Asn
945                 950                 955                 960
```

FIG.4K

```
acc gcc cta caa acc ttt acc gtt aaa aag gta gat gaa aat gat aag   2928
Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asp Lys
                965                 970                 975

gct gat gac acc aac gcc atc acc gtg ggt aaa gat ggc aca agt ggt   2976
Ala Asp Asp Thr Asn Ala Ile Thr Val Gly Lys Asp Gly Thr Ser Gly
            980                 985                 990

aaa gtc aac acc tta aaa ctc aaa ggt aaa aac ggt ctt gat att aaa   3024
Lys Val Asn Thr Leu Lys Leu Lys Gly Lys Asn Gly Leu Asp Ile Lys
        995                1000                1005

acc gac aaa gat ggt acg gtt acc ttt ggc att aac acc caa agc ggt   3072
Thr Asp Lys Asp Gly Thr Val Thr Phe Gly Ile Asn Thr Gln Ser Gly
    1010                1015                1020

ctt aaa gcc ggc gac agc acc act cta aac aac aat ggc ttg tct att   3120
Leu Lys Ala Gly Asp Ser Thr Thr Leu Asn Asn Asn Gly Leu Ser Ile
1025                1030                1035                1040

aaa aac acc gct agt aac gaa caa atc caa gtc ggt gct gat ggc gtg   3168
Lys Asn Thr Ala Ser Asn Glu Gln Ile Gln Val Gly Ala Asp Gly Val
                1045                1050                1055
```

FIG.4L

```
aag ttt gcc atg gtt aat aat ggt gtt gta ggt gct ggc att gat ggc   3216
Lys Phe Ala Met Val Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly
          1060                1065                1070

aca act cgc att acc aga gat gaa att ggc ttt act ggg act aat ggc   3264
Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly
      1075                1080                1085

tca ctt gat aaa agc aaa ccc cac cta agc aaa gac ggc att aac gca   3312
Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala
  1090                1095                1100

ggt ggt aaa aag att acc aac att caa tca ggt gag att gcc aaa aac   3360
Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Lys Asn
1105                1110                1115                1120

agc cat gat gct gtg aca ggc ggc aag att tat gat tta aaa acc gaa   3408
Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu
              1125                1130                1135

ctt gaa aat aaa atc agc agt act gcc aaa aca gca caa aac tca tta   3456
Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu
          1140                1145                1150
```

FIG.4M

```
cac gaa ttc tca gta gca gat gaa caa ggt aat aac ttt acg gtt agt   3504
His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser
      1155                1160                1165

aac cct tac tcc agt tat gac acc tca aag acc tct gat gtc atc acc   3552
Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr
   1170                1175                1180

ttt gca ggt gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg   3600
Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val
1185                1190                1195                1200

cgt gtg ggc att gac caa acc aaa ggc tta acc acg cct aag ctg acc   3648
Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr
                1205                1210                1215

gtg ggt aat aat aat ggc aaa ggc att gtc att aac agc caa aat ggt   3696
Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asn Ser Gln Asn Gly
          1220                1225                1230

caa aat acc atc aca gga cta agc aac act cta gct aat gtt acc aat   3744
Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn
      1235                1240                1245
```

FIG.4N

```
gat aaa ggt agc gta cgc acc aca gaa cag ggc aat ata atc aaa gac   3792
Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp
   1250                1255                1260

gaa gac aaa acc cgt gcc gcc agc att gtt gat gtg cta agc gca ggc   3840
Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly
1265                1270                1275                1280

ttt aac ttg caa ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat   3888
Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr
                1285                1290                1295

gac acc gtc aac ttt gcc aat ggc aat acc acc acc gct aag gtg acc   3936
Asp Thr Val Asn Phe Ala Asn Gly Asn Thr Thr Thr Ala Lys Val Thr
           1300                1305                1310

tat gat gac aca agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg   3984
Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val
       1315                1320                1325

gat gat aca acc att gaa gtt aaa gat aaa aaa ctt ggc gta aaa acc   4032
Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr
   1330                1335                1340
```

FIG.40

```
acc aca ttg acc agt act ggc aca ggt gct aat aaa ttt gcc cta agc   4080
Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser
1345                1350                1355                1360

aat caa gct act ggc gat gcg ctt gtc aag gcc agt gat atc gtt gct   4128
Asn Gln Ala Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala
                1365                1370                1375

cat cta aac acc tta tct ggc gac atc caa act gcc aaa ggg gca agc   4176
His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser
            1380                1385                1390

caa gcg aac aac tca gca ggc tat gtg gat gct gat ggc aat aag gtc   4224
Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val
        1395                1400                1405

atc tat gac agt acc gat aac aag tac tat caa gcc aaa aat gat ggc   4272
Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly
    1410                1415                1420

aca gtt gat aaa acc aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa   4320
Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln
1425                1430                1435                1440
```

FIG.4P

```
gcc caa acc cca gat ggc aca ttg gct caa atg aat gtc aaa tca gtc   4368
Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val
                1445                1450                1455

att aac aaa gaa caa gta aat gat gcc aat aaa aag caa ggc atc aat   4416
Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn
            1460                1465                1470

gaa gac aac gcc ttt gtt aaa gga ctt gaa aaa gcc gct tct gat aac   4464
Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn
        1475                1480                1485

aaa acc aaa aac gcc gca gta act gtg ggt gat tta aat gcc gtt gcc   4512
Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala
    1490                1495                1500

caa aca ccg ctg acc ttt gca ggg gat aca ggc aca acg gct aaa aaa   4560
Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys
1505                1510                1515                1520

ctg ggc gag act ttg acc atc aaa ggt ggg caa aca gac acc aat aag   4608
Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys
                1525                1530                1535
```

FIG.4Q

```
cta acc gat aat aac atc ggt gtg gta gca ggt act gat ggc ttc act   4656
Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr
          1540                1545                1550

gtc aaa ctt gcc aaa gac cta acc aat ctt aac agc gtt aat gca ggt   4704
Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly
       1555                1560                1565

ggc acc aaa att gat gaa aaa ggc atc tct ttt gta gac gca aac ggt   4752
Gly Thr Lys Ile Asp Glu Lys Gly Ile Ser Phe Val Asp Ala Asn Gly
   1570                1575                1580

caa gcc aaa gca aac acc cct gtg cta agt gcc aat ggg ctg gac ctg   4800
Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu
1585                1590                1595                1600

ggt ggc aag gtc atc agt aat gtg ggc aaa ggc aca aaa gat acc gac   4848
Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp
                1605                1610                1615

gct gcc aat gta caa cag tta aac gaa gta cgc aac ttg ttg ggt ctt   4896
Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu
          1620                1625                1630
```

FIG.4R

```
ggt aat gat aac gct gac ggc aat cag gta aac att gcc gac atc aaa   4944
Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys
       1635                1640                1645

aaa gac cca aat tca ggt tca tca tct aac cgc act gtc atc aaa gca   4992
Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala
   1650                1655                1660

ggc acg gta ctt ggc ggt aaa ggt aat aac gat acc gaa aaa ctt gcc   5040
Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala
1665                1670                1675                1680

act ggt ggt gta caa gtg ggc gtg gat aaa gac ggc aac gct aac ggc   5088
Thr Gly Gly Val Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly
                1685                1690                1695

gat tta agc aat gtt tgg gtc aaa acc caa aaa gat ggc agc aaa aaa   5136
Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys
          1700                1705                1710

gcc ctg ctc gcc act tat aac gcc gca ggt cag acc aac tat gtg acc   5184
Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn Tyr Val Thr
       1715                1720                1725
```

FIG.4S

```
aac aac ccc gca gaa gcc att gac aga ata aat gaa caa ggt atc cgc   5232
Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg
   1730                1735                1740

ttc ttc cat gtc aac gat ggc aat caa gag cct gtg gta caa ggg cgt   5280
Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val Gln Gly Arg
1745                1750                1755                1760

aac ggc att gac tca agt gcc tca ggc aag cac tca gtg gcg ata ggt   5328
Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val Ala Ile Gly
                1765                1770                1775

ttc cag gcc aag gca gat ggt gaa gcc gcc gtt gcc ata ggc aga caa   5376
Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile Gly Arg Gln
           1780                1785                1790

acc caa gca ggc aac caa tcc atc gcc atc ggt gat aac gca caa gcc   5424
Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn Ala Gln Ala
       1795                1800                1805

acg ggc gat caa tcc atc gcc atc ggt aca ggc aat gtg gta gca ggt   5472
Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val Val Ala Gly
   1810                1815                1820
```

FIG.4T

```
aag cac tct ggt gcc atc ggc gac cca agc act gtt aag gct gat aac   5520
Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys Ala Asp Asn
1825                 1830                 1835                 1840

agt tac agt gtg ggt aat aac aac cag ttt acc gat gcc act caa acc   5568
Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala Thr Gln Thr
                1845                 1850                 1855

gat gtc ttt ggt gtg ggc aat aac atc acc gtg acc gaa agt aac tcg   5616
Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu Ser Asn Ser
          1860                 1865                 1870

gtt gcc tta ggt tca aac tct gcc atc agt gca ggc aca cac gca ggc   5664
Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr His Ala Gly
       1875                 1880                 1885

aca caa gcc aaa aaa tct gac ggc aca gca ggt aca acc acc aca gca   5712
Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr Thr Thr Ala
   1890                 1895                 1900

ggt gcc aca ggt acg gtt aaa ggc ttt gct gga caa acg gcg gtt ggt   5760
Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr Ala Val Gly
1905                 1910                 1915                 1920
```

FIG.4U

```
gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc cgt atc caa aat gtg   5808
Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile Gln Asn Val
                1925                1930                1935

gca gca ggt gag gtc agt gcc acc agc acc gat gcg gtc aat ggt agc   5856
Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val Asn Gly Ser
            1940                1945                1950

cag ttg tac aaa gcc acc caa agc att gcc aac gca acc aat gag ctt   5904
Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr Asn Glu Leu
        1955                1960                1965

gac cat cgt atc cac caa aac gaa aat aaa gcc aat gca ggg att tca   5952
Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala Gly Ile Ser
    1970                1975                1980

tca gcg atg gcg atg gcg tcc atg cca caa gcc tac att cct ggc aga   6000
Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile Pro Gly Arg
1985                1990                1995                2000

tcc atg gtt acc ggg ggt att gcc acc cac aac ggt caa ggt gcg gtg   6048
Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln Gly Ala Val
                2005                2010                2015
```

FIG.4V

```
gca gtg gga ctg tcg aag ctg tcg gat aat ggt caa tgg gta ttt aaa   6096
Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp Val Phe Lys
          2020                2025                2030

atc aat ggt tca gcc gat acc caa ggc cat gta ggg gcg gca gtt ggt   6144
Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala Ala Val Gly
      2035                2040                2045

gca ggt ttt cac ttt                                              6159
Ala Gly Phe His Phe
   2050
```

FIG.5A

Moraxella catarrhalis les1 200kDa

```
ATG aat cac atc tat aaa gtc atc ttt aac aaa gcc aca ggc aca ttt   48
Met Asn His Ile Tyr Lys Val Ile Phe Asn Lys Ala Thr Gly Thr Phe
  1               5                  10                  15

atg gcc gtg gca gag tgc gcc aaa tcc cac agc gga ggg agt agc agt   96
Met Ala Val Ala Glu Cys Ala Lys Ser His Ser Gly Gly Ser Ser Ser
             20                  25                  30

agt acc gca gga cag gtg ggc agc tct cct gtc atc cgc ctg act cgt  144
Ser Thr Ala Gly Gln Val Gly Ser Ser Pro Val Ile Arg Leu Thr Arg
         35                  40                  45

gtt gcc acg ctc gct atc cta gtg atc ggt gcg acg ctc aat ggc agt  192
Val Ala Thr Leu Ala Ile Leu Val Ile Gly Ala Thr Leu Asn Gly Ser
     50                  55                  60

gct tat gct caa aat aat agc aag atc gca ttt ggt acc aca ggc aac  240
Ala Tyr Ala Gln Asn Asn Ser Lys Ile Ala Phe Gly Thr Thr Gly Asn
 65                  70                  75                  80

aat gac aat gcc tcg gct agc aat gaa gca tcc att gct att ggt agt  288
Asn Asp Asn Ala Ser Ala Ser Asn Glu Ala Ser Ile Ala Ile Gly Ser
                 85                  90                  95
```

FIG.5B

```
ctt gct aag gca cat gcc aat caa gct att gct atc ggt ggt agc aaa   336
Leu Ala Lys Ala His Ala Asn Gln Ala Ile Ala Ile Gly Gly Ser Lys
            100                 105                 110

cca gat cct cgt aat caa gcg gct aat cag aag gca ggt tcc cac gcc   384
Pro Asp Pro Arg Asn Gln Ala Ala Asn Gln Lys Ala Gly Ser His Ala
        115                 120                 125

aaa ggt aaa gag tcc atc gcc atc ggt ggt gat gta ctg gct gag ggt   432
Lys Gly Lys Glu Ser Ile Ala Ile Gly Gly Asp Val Leu Ala Glu Gly
    130                 135                 140

gat gcc tcg att gcc att ggt agt gat gac tta tat ttg gat agg aat   480
Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu Tyr Leu Asp Arg Asn
145                 150                 155                 160

agc act aac tct aaa tat cca aat ggt ctt ctt agc act ctt att caa   528
Ser Thr Asn Ser Lys Tyr Pro Asn Gly Leu Leu Ser Thr Leu Ile Gln
                165                 170                 175

aac cat aca gta tta cgc caa ata cga gac tca aat ggt tct cag aaa   576
Asn His Thr Val Leu Arg Gln Ile Arg Asp Ser Asn Gly Ser Gln Lys
            180                 185                 190
```

FIG.5C

```
tat aga cgc aca gca gca gaa gga cac gcc agt act gca gtg gga gcc   624
Tyr Arg Arg Thr Ala Ala Glu Gly His Ala Ser Thr Ala Val Gly Ala
        195                 200                 205

atg gca tat gca aag ggt cat ttt gcc aac gcc ttt ggt aca cgg tca   672
Met Ala Tyr Ala Lys Gly His Phe Ala Asn Ala Phe Gly Thr Arg Ser
    210                 215                 220

aca gct gaa ggc aac tat tcc ttg gca gta ggt ctt acc gcc aaa gcc   720
Thr Ala Glu Gly Asn Tyr Ser Leu Ala Val Gly Leu Thr Ala Lys Ala
225                 230                 235                 240

gaa aaa gga tat aca atc gct att ggt tct aat gca caa gct atc aat   768
Glu Lys Gly Tyr Thr Ile Ala Ile Gly Ser Asn Ala Gln Ala Ile Asn
                245                 250                 255

tat gga gca cta gcc ctt ggt gca gat act cga gtt gat ttg gat tac   816
Tyr Gly Ala Leu Ala Leu Gly Ala Asp Thr Arg Val Asp Leu Asp Tyr
            260                 265                 270

ggt att gcc cta ggt tat ggt tct cag atc ctt aat aat aat aat aat   864
Gly Ile Ala Leu Gly Tyr Gly Ser Gln Ile Leu Asn Asn Asn Asn Asn
        275                 280                 285
```

FIG.5D

```
aat aat aat aaa gcc tat gta cca gaa ggt aat ggg tca aac ata aaa   912
Asn Asn Asn Lys Ala Tyr Val Pro Glu Gly Asn Gly Ser Asn Ile Lys
    290                 295                 300

tcg tct aaa gcc acc ggc aat ggt tta ttt tcc att ggt agt agc act   960
Ser Ser Lys Ala Thr Gly Asn Gly Leu Phe Ser Ile Gly Ser Ser Thr
305                 310                 315                 320

atc aag cgt aaa atc atc aat gtc ggt gca ggt tat gag gat acc gat   1008
Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Tyr Glu Asp Thr Asp
                325                 330                 335

gcg gtc aat gtg gca cag cta aaa gcg gtg gag aat ctg gct aag cgt   1056
Ala Val Asn Val Ala Gln Leu Lys Ala Val Glu Asn Leu Ala Lys Arg
            340                 345                 350

caa att act ttt aag ggt gat gat aac ggt act ggc gtt aag aaa aaa   1104
Gln Ile Thr Phe Lys Gly Asp Asp Asn Gly Thr Gly Val Lys Lys Lys
        355                 360                 365

ctg ggc gag act tta acc att aaa ggt ggt gag acc caa gcg gac aag   1152
Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Glu Thr Gln Ala Asp Lys
    370                 375                 380
```

FIG.5E

```
cta acc gat aat aat aac att ggt gtg gta aca gat aat aat act ggt   1200
Leu Thr Asp Asn Asn Asn Ile Gly Val Val Thr Asp Asn Asn Thr Gly
385                 390                 395                 400

ctg aaa gtt aaa ctt gct aaa aac cta agc ggt ctt gaa aca gtt agc   1248
Leu Lys Val Lys Leu Ala Lys Asn Leu Ser Gly Leu Glu Thr Val Ser
                405                 410                 415

acc aaa aac cta acc gcc agc gag aaa gtt acg gta ggt agt ggt aat   1296
Thr Lys Asn Leu Thr Ala Ser Glu Lys Val Thr Val Gly Ser Gly Asn
            420                 425                 430

aac acc gct gag cta caa agc ggt ggt tta acc ttt acc cca aca aca   1344
Asn Thr Ala Glu Leu Gln Ser Gly Gly Leu Thr Phe Thr Pro Thr Thr
        435                 440                 445

aat gca agc aca gac aaa acc gtc tat ggc act gat ggg ctt aag ttt   1392
Asn Ala Ser Thr Asp Lys Thr Val Tyr Gly Thr Asp Gly Leu Lys Phe
    450                 455                 460

act gat aat tct aat acg gca ctt gaa gat act act cgt atc acc aaa   1440
Thr Asp Asn Ser Asn Thr Ala Leu Glu Asp Thr Thr Arg Ile Thr Lys
465                 470                 475                 480
```

FIG.5F

```
gat aaa att ggt ttt agc aat aaa gct ggt aca gtt gat gaa aac aaa   1488
Asp Lys Ile Gly Phe Ser Asn Lys Ala Gly Thr Val Asp Glu Asn Lys
                485                 490                 495

cct tat ctt gat aaa gac aag cta aaa gtt ggc aac agc acc cta aac   1536
Pro Tyr Leu Asp Lys Asp Lys Leu Lys Val Gly Asn Ser Thr Leu Asn
            500                 505                 510

aac ggt ggc ttg act gtt aat aac acc att ggt ggt agc aat aaa caa   1584
Asn Gly Gly Leu Thr Val Asn Asn Thr Ile Gly Gly Ser Asn Lys Gln
        515                 520                 525

atc caa gtc ggt gct gat ggc att aaa ttt gcc gat gtg aat gtt aat   1632
Ile Gln Val Gly Ala Asp Gly Ile Lys Phe Ala Asp Val Asn Val Asn
    530                 535                 540

gta tca aat gcc gca aaa ttc ggc act act cgt att acc gaa gag gaa   1680
Val Ser Asn Ala Ala Lys Phe Gly Thr Thr Arg Ile Thr Glu Glu Glu
545                 550                 555                 560

att ggc ttt gct gat gct gat ggt aaa gtt gat aaa aag tca cca tat   1728
Ile Gly Phe Ala Asp Ala Asp Gly Lys Val Asp Lys Lys Ser Pro Tyr
                565                 570                 575
```

FIG.5G

```
ttg gat aaa aaa caa ctt caa gtg ggt ggt gtt aaa att acc aaa gac   1776
Leu Asp Lys Lys Gln Leu Gln Val Gly Gly Val Lys Ile Thr Lys Asp
            580                 585                 590

agt ggc att aat gca ggt gat caa aag atc agt aat gtt aaa gat gca   1824
Ser Gly Ile Asn Ala Gly Asp Gln Lys Ile Ser Asn Val Lys Asp Ala
        595                 600                 605

acg gac gat acc gat gca gtc act tat aaa cag ctt aaa caa gtc caa   1872
Thr Asp Asp Thr Asp Ala Val Thr Tyr Lys Gln Leu Lys Gln Val Gln
    610                 615                 620

caa gac gcc gac ggt gcc cta caa agc ttc tct att cgt gat gaa aaa   1920
Gln Asp Ala Asp Gly Ala Leu Gln Ser Phe Ser Ile Arg Asp Glu Lys
625                 630                 635                 640

ggt cag gaa ttt acg att agt aac ttg tat tct aat ggt aat acc cca   1968
Gly Gln Glu Phe Thr Ile Ser Asn Leu Tyr Ser Asn Gly Asn Thr Pro
                645                 650                 655

aat acc ttt gag acc atc acc ttt gca ggt gaa aac ggc atc agt atc   2016
Asn Thr Phe Glu Thr Ile Thr Phe Ala Gly Glu Asn Gly Ile Ser Ile
            660                 665                 670
```

FIG.5H

```
agc aat gac ata gcc aaa ggt aaa gtc aaa gtt ggt att gac cca atc   2064
Ser Asn Asp Ile Ala Lys Gly Lys Val Lys Val Gly Ile Asp Pro Ile
        675                 680                 685

aat ggt ctc acc acg cct aag ctg acc gtg ggt agc gat aaa gat ggt   2112
Asn Gly Leu Thr Thr Pro Lys Leu Thr Val Gly Ser Asp Lys Asp Gly
    690                 695                 700

aaa act caa ttg gtt att gag caa gtg gct agc ggt aac gac acc aaa   2160
Lys Thr Gln Leu Val Ile Glu Gln Val Ala Ser Gly Asn Asp Thr Lys
705                 710                 715                 720

aac atc att aga gga ttg tcc cca aca ctg cct agc att acc aat gca   2208
Asn Ile Ile Arg Gly Leu Ser Pro Thr Leu Pro Ser Ile Thr Asn Ala
                725                 730                 735

ggt ggc gta cgc acc aca gaa cag ggc aat aca atc acc agc gac gaa   2256
Gly Gly Val Arg Thr Thr Glu Gln Gly Asn Thr Ile Thr Ser Asp Glu
            740                 745                 750

gac aaa tcc aaa gcc gcc agt atc ggt gat ata tta aat aca ggc ttt   2304
Asp Lys Ser Lys Ala Ala Ser Ile Gly Asp Ile Leu Asn Thr Gly Phe
        755                 760                 765
```

FIG.5I

```
aac cta aaa aat aat agc aac tcc gtt ggc ttt gtc tcc act tat aac   2352
Asn Leu Lys Asn Asn Ser Asn Ser Val Gly Phe Val Ser Thr Tyr Asn
    770                 775                 780

act gtt gac ttt atc gat ggc aat gcc acc acc gct aag gta act tac   2400
Thr Val Asp Phe Ile Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr
785                 790                 795                 800

gat gaa acc aat caa acc agt aaa gta act tat gat gtc aat gtg gat   2448
Asp Glu Thr Asn Gln Thr Ser Lys Val Thr Tyr Asp Val Asn Val Asp
                805                 810                 815

gag aaa acc att gaa ctc aca ggc gat aat ggc aag aca aac aaa att   2496
Glu Lys Thr Ile Glu Leu Thr Gly Asp Asn Gly Lys Thr Asn Lys Ile
            820                 825                 830

ggc gtc aaa acc acc aca ctg acc aca aca aat gct aat ggt aaa gca   2544
Gly Val Lys Thr Thr Thr Leu Thr Thr Thr Asn Ala Asn Gly Lys Ala
        835                 840                 845

acc aac ttt agt acc acc gat aac gat gcc ctt gtt aac gcc aaa gac   2592
Thr Asn Phe Ser Thr Thr Asp Asn Asp Ala Leu Val Asn Ala Lys Asp
    850                 855                 860
```

FIG.5J

```
atc gcc gaa aat cta aac acc cta gcc aag gaa att cac acc acc aaa   2640
Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys
865                 870                 875                 880

ggc aca gca gac acc gcc cta caa acc ttt aaa gtc aaa aaa gac ggt   2688
Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Lys Val Lys Lys Asp Gly
                885                 890                 895

gca act gat gac gaa acc atc acc gtg ggt aaa gat ggt aca caa aac   2736
Ala Thr Asp Asp Glu Thr Ile Thr Val Gly Lys Asp Gly Thr Gln Asn
            900                 905                 910

ggc aag acc gtc aac act cta aaa ctc aaa ggt gaa aac ggt cta acg   2784
Gly Lys Thr Val Asn Thr Leu Lys Leu Lys Gly Glu Asn Gly Leu Thr
        915                 920                 925

gtt gct acc aat aaa gat ggt acg gtt acc ttt ggc att aac acc caa   2832
Val Ala Thr Asn Lys Asp Gly Thr Val Thr Phe Gly Ile Asn Thr Gln
    930                 935                 940

agc ggt ctt aaa gcc ggc gac agc acc act cta aac aaa gat ggc ttg   2880
Ser Gly Leu Lys Ala Gly Asp Ser Thr Thr Leu Asn Lys Asp Gly Leu
945                 950                 955                 960
```

FIG.5K

```
tct att aaa aac ccc gct agt aac gaa caa atc caa gtc ggt gct gat   2928
Ser Ile Lys Asn Pro Ala Ser Asn Glu Gln Ile Gln Val Gly Ala Asp
                965                 970                 975

ggc gtg aag ttt gcc aag gtt gat aag ggt aat tca agc act ggc att   2976
Gly Val Lys Phe Ala Lys Val Asp Lys Gly Asn Ser Ser Thr Gly Ile
            980                 985                 990

gat ggc aca agc cgt atc acc aaa gat caa att ggc ttt act ggg gct   3024
Asp Gly Thr Ser Arg Ile Thr Lys Asp Gln Ile Gly Phe Thr Gly Ala
        995                1000                1005

aat ggc tca ctt gat acc acc aaa ccc cac cta acc aaa gac aag ctt   3072
Asn Gly Ser Leu Asp Thr Thr Lys Pro His Leu Thr Lys Asp Lys Leu
    1010                1015                1020

aaa gtg ggt gaa gtt gaa att acc aac act ggc att aac gca ggt ggt   3120
Lys Val Gly Glu Val Glu Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly
1025                1030                1035                1040

aaa aag att acc aac att caa tca ggt gat att acc caa aac agc aat   3168
Lys Lys Ile Thr Asn Ile Gln Ser Gly Asp Ile Thr Gln Asn Ser Asn
                1045                1050                1055
```

FIG.5L

```
gat gct gtg aca ggc ggt cgg gtt tat gat tta aaa acc gaa ctt gaa   3216
Asp Ala Val Thr Gly Gly Arg Val Tyr Asp Leu Lys Thr Glu Leu Glu
          1060                1065                1070

agc aaa atc aac agt gct gct aaa aca gca caa aac tca tta cac gaa   3264
Ser Lys Ile Asn Ser Ala Ala Lys Thr Ala Gln Asn Ser Leu His Glu
      1075                1080                1085

ttc tca gta gca gat gaa caa ggt aat cac ttt acg gtt agt aac cct   3312
Phe Ser Val Ala Asp Glu Gln Gly Asn His Phe Thr Val Ser Asn Pro
   1090                1095                1100

tac tcc agt tat gac acc tca aag acc tct gat gtc atc acc ttt gca   3360
Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr Phe Ala
1105                1110                1115                1120

ggt gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg cgt gtg   3408
Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val Arg Val
               1125                1130                1135

ggc att gac caa acc aaa ggc tta acc acg cct aag ctg acc gtg ggt   3456
Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr Val Gly
          1140                1145                1150
```

FIG.5M

```
aat aat aat ggc aaa ggc att gtc att gac agt aaa gat ggt caa aat   3504
Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Lys Asp Gly Gln Asn
      1155                1160                1165

acc atc aca gga cta agc aac act cta gct aat gtt acc aat gat ggt   3552
Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn Asp Gly
   1170                1175                1180

gca gga cac gca cta agc caa ggg ctt gcc aat gac acc gac aaa acc   3600
Ala Gly His Ala Leu Ser Gln Gly Leu Ala Asn Asp Thr Asp Lys Thr
1185                1190                1195                1200

cgt gcc gcc agc att ggt gat gtg cta aac gca ggc ttt aac ttg caa   3648
Arg Ala Ala Ser Ile Gly Asp Val Leu Asn Ala Gly Phe Asn Leu Gln
               1205                1210                1215

ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat gac act gtt gac   3696
Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asp
          1220                1225                1230

ttt atc gat ggc aat gcc acc acc gct aag gtg acc tat gat gac aca   3744
Phe Ile Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr
      1235                1240                1245
```

FIG.5N

```
agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg gat aat aaa acc   3792
Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asn Lys Thr
   1250                1255                1260

att gaa gtg aca agt gat aaa aaa ctt ggc gtc aaa acc acc aca ctg   3840
Ile Glu Val Thr Ser Asp Lys Lys Leu Gly Val Lys Thr Thr Thr Leu
1265                1270                1275                1280

acc aaa aca agt gct aat ggt aat gca acc aaa ttt agt gcc gcc gat   3888
Thr Lys Thr Ser Ala Asn Gly Asn Ala Thr Lys Phe Ser Ala Ala Asp
                1285                1290                1295

ggc gat gcc ctt gtt aaa gcc agt gat atc gcc acc cat cta aat acc   3936
Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Ala Thr His Leu Asn Thr
          1300                1305                1310

ttg gct ggc gac atc caa acc gcc aaa ggg gca agc caa gca agc agc   3984
Leu Ala Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser Gln Ala Ser Ser
       1315                1320                1325

tca gca agc tat gtg gat gct gat ggc aac aag gtc atc tat gac agt   4032
Ser Ala Ser Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser
   1330                1335                1340
```

FIG.5O

```
acc gat aag aag tac tat caa gtc aat gac aag ggt caa gtg gac aaa   4080
Thr Asp Lys Lys Tyr Tyr Gln Val Asn Asp Lys Gly Gln Val Asp Lys
1345                1350                1355                1360

aac aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa gcc caa acc cca   4128
Asn Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro
                1365                1370                1375

gat ggc aca ttg gct caa atg aat gtc aaa tca gtc att aac aaa gag   4176
Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu
            1380                1385                1390

caa gta aat gat gcc aat aaa aag caa ggc atc aat gaa gac aac gcc   4224
Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala
        1395                1400                1405

ttt atc aaa ggg ctt gaa aac gcc gcc aaa gac acc aaa acc aaa aac   4272
Phe Ile Lys Gly Leu Glu Asn Ala Ala Lys Asp Thr Lys Thr Lys Asn
    1410                1415                1420

gcc gca gta act gtg ggt gat tta aat gcc gtt gcc caa aca ccg ctg   4320
Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu
1425                1430                1435                1440
```

FIG.5P

```
acc ttt gca ggg gat aca ggc aca acg gct aaa aaa ctg ggc gag act   4368
Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr
                1445                1450                1455

ttg acc atc aaa ggt ggg caa aca gac acc aat aag cta acc gat aat   4416
Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn
            1460                1465                1470

aac atc ggt gtg gta gca ggt act gat ggc ttc act gtc aaa ctt gcc   4464
Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala
        1475                1480                1485

aaa gac cta acc aat ctt aac agc gtt aat gca ggt ggc acc aga att   4512
Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Arg Ile
    1490                1495                1500

gat gaa aaa ggc atc tct ttt gta gac gca aac ggt caa gcc aaa gca   4560
Asp Glu Lys Gly Ile Ser Phe Val Asp Ala Asn Gly Gln Ala Lys Ala
1505                1510                1515                1520

aac acc cct gtg cta agt gcc aat ggg ctg gac ctg ggt ggc aaa cgc   4608
Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Arg
                1525                1530                1535
```

FIG.5Q

```
atc agt aac atc ggt gca gct gtt gat gat aac gat gcg gtg aac ttt   4656
Ile Ser Asn Ile Gly Ala Ala Val Asp Asp Asn Asp Ala Val Asn Phe
          1540                1545                1550

aag cag ttt aat gaa gtt gcc aaa acg gtc aac aac cta aac aac caa   4704
Lys Gln Phe Asn Glu Val Ala Lys Thr Val Asn Asn Leu Asn Asn Gln
       1555                1560                1565

agt aac tca ggt gcg tca tta ccc ttt gtg gta acc gat gcc aat ggc   4752
Ser Asn Ser Gly Ala Ser Leu Pro Phe Val Val Thr Asp Ala Asn Gly
   1570                1575                1580

aag ccc atc aat ggc acc gat ggc aag ccc caa aaa gcc atc aag ggc   4800
Lys Pro Ile Asn Gly Thr Asp Gly Lys Pro Gln Lys Ala Ile Lys Gly
1585                1590                1595                1600

gcc gat ggt aaa tac tat cac gcc aac gcc aac ggc gta cct gtg gac   4848
Ala Asp Gly Lys Tyr Tyr His Ala Asn Ala Asn Gly Val Pro Val Asp
                1605                1610                1615

aaa gat ggc aag ccc atc acc gat gcg gac aaa ctt gcc aat ctg gca   4896
Lys Asp Gly Lys Pro Ile Thr Asp Ala Asp Lys Leu Ala Asn Leu Ala
          1620                1625                1630
```

FIG.5R

```
gct cat ggc aaa ccc ctt gat gca ggt cat caa gtg gtg gca agc cta   4944
Ala His Gly Lys Pro Leu Asp Ala Gly His Gln Val Val Ala Ser Leu
      1635                1640                1645

ggc ggc aac tca gat gcc atc acc cta acc aac atc aag tcc act ttg   4992
Gly Gly Asn Ser Asp Ala Ile Thr Leu Thr Asn Ile Lys Ser Thr Leu
   1650                1655                1660

cca caa att gac aca cca aac aca ggt aat gcc aat gca ggg caa gcc   5040
Pro Gln Ile Asp Thr Pro Asn Thr Gly Asn Ala Asn Ala Gly Gln Ala
1665                1670                1675                1680

caa agt ctg ccc agc cta tca gca gca cag caa agt aat gct gcc agt   5088
Gln Ser Leu Pro Ser Leu Ser Ala Ala Gln Gln Ser Asn Ala Ala Ser
                1685                1690                1695

gtc aaa gat gtg cta aat gta ggc ttt aac ttg cag acc aat cac aat   5136
Val Lys Asp Val Leu Asn Val Gly Phe Asn Leu Gln Thr Asn His Asn
          1700                1705                1710

caa gtg gac ttt gtc aaa gcc tat gat acc gtc aac ttt gtc aat ggt   5184
Gln Val Asp Phe Val Lys Ala Tyr Asp Thr Val Asn Phe Val Asn Gly
      1715                1720                1725
```

FIG.5S

```
aca ggt gcc gac atc aca agc gtg cgt agt gct gat ggc acg atg agt   5232
Thr Gly Ala Asp Ile Thr Ser Val Arg Ser Ala Asp Gly Thr Met Ser
   1730                1735                1740

aac atc acc gtc aac acc gcc tta gca gcg acc gat gat gat ggc aat   5280
Asn Ile Thr Val Asn Thr Ala Leu Ala Ala Thr Asp Asp Asp Gly Asn
1745                1750                1755                1760

gtg ctt atc aaa gcc aaa gat ggt aag ttc tac aaa gca gac gac ctc   5328
Val Leu Ile Lys Ala Lys Asp Gly Lys Phe Tyr Lys Ala Asp Asp Leu
                1765                1770                1775

atg cca aac ggc tca cta aaa gca ggc aaa tca gcc agt gat gcc aaa   5376
Met Pro Asn Gly Ser Leu Lys Ala Gly Lys Ser Ala Ser Asp Ala Lys
          1780                1785                1790

act cca act ggt cta agc ctt gtt aac ccc aat gct ggt aaa ggc agt   5424
Thr Pro Thr Gly Leu Ser Leu Val Asn Pro Asn Ala Gly Lys Gly Ser
       1795                1800                1805

aca ggc gat gca gtg gct ctt aat aac tta tca aaa gcg gta ttt aaa   5472
Thr Gly Asp Ala Val Ala Leu Asn Asn Leu Ser Lys Ala Val Phe Lys
   1810                1815                1820
```

FIG.5T

```
tcc aaa gat ggt aca act act acc aca gta agc tct gat ggc atc agt   5520
Ser Lys Asp Gly Thr Thr Thr Thr Val Ser Ser Asp Gly Ile Ser
1825                1830                1835                1840

atc caa ggc aaa gat aac agc agc atc acc cta agc aaa gat ggg ctg   5568
Ile Gln Gly Lys Asp Asn Ser Ser Ile Thr Leu Ser Lys Asp Gly Leu
                1845                1850                1855

aat gta ggc ggt aag gtc atc agc aat gtg ggt aaa ggc aca aaa gac   5616
Asn Val Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp
            1860                1865                1870

acc gac gct gcc aat gta caa cag tta aac gaa gta cgc aac ttg ttg   5664
Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu
        1875                1880                1885

ggt ctt ggt aat gct ggt aat gat aac gct gac ggc aat cag gta aac   5712
Gly Leu Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn
    1890                1895                1900

att gcc gac atc aaa aaa gac cca aat tca ggt tca tca tct aac cgc   5760
Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg
1905                1910                1915                1920
```

FIG.5U

```
act gtc atc aaa gca ggc acg gta ctt ggc ggt aaa ggt aat aac gat   5808
Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp
                1925                1930                1935

acc gaa aaa ctt gcc act ggt ggt gta caa gtg ggc gtg gat aaa gac   5856
Thr Glu Lys Leu Ala Thr Gly Gly Val Gln Val Gly Val Asp Lys Asp
            1940                1945                1950

ggc aac gct aac ggc gat tta agc aat gtt tgg gtc aaa acc caa aaa   5904
Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys
        1955                1960                1965

gat ggc agc aaa aaa gcc ctg ctc gcc act tat aac gcc gca ggt cag   5952
Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln
    1970                1975                1980

acc aac tat ttg acc aac aac ccc gca gaa gcc att gac aga ata aat   6000
Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn
1985                1990                1995                2000

gaa caa ggt atc cgc ttc ttc cat gtc aac gat ggc aat caa gag cct   6048
Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro
                2005                2010                2015
```

FIG.5V

```
gtg gta caa ggg cgt aac ggc att gac tca agt gcc tca ggc aag cac   6096
Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His
          2020                2025                2030

tca gtg gcg ata ggt ttc cag gcc aag gca gat ggt gaa gcc gcc gtt   6144
Ser Val Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val
       2035                2040                2045

gcc ata ggc aga caa acc caa gca ggc aac caa tcc atc gcc atc ggt   6192
Ala Ile Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly
   2050                2055                2060

gat aac gca caa gcc acg ggc gat caa tcc atc gcc atc ggt aca ggc   6240
Asp Asn Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly
2065                2070                2075                2080

aat gtg gta aca ggt aag cac tct ggt gcc atc ggc gac cca agc act   6288
Asn Val Val Thr Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr
               2085                2090                2095

gtt aag gct gat aac agt tac agt gtg ggt aat aac aac cag ttt atc   6336
Val Lys Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Ile
          2100                2105                2110
```

FIG.5W

```
gat gcc act cag acc gat gtc ttt ggt gtg ggc aat aac atc acc gtg   6384
Asp Ala Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val
       2115                2120                2125

acc gaa agt aac tcg gtt gcc tta ggt tca aac tct gcc atc agt gca   6432
Thr Glu Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala
   2130                2135                2140

ggc aca cac gca ggc aca caa gcc aaa aaa tct gac ggc aca gca ggt   6480
Gly Thr His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly
2145                2150                2155                2160

aca acc acc aca gca ggt gca aca ggt acg gtt aaa ggc ttt gct gga   6528
Thr Thr Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly
                2165                2170                2175

caa acg gcg gtt ggt gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc   6576
Gln Thr Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg
           2180                2185                2190

cgt atc caa aat gtg gca gca ggt gag gtc agt gcc acc agc acc gat   6624
Arg Ile Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp
       2195                2200                2205
```

FIG.5X

```
gcg gtc aat ggt agc cag ttg tac aaa gcc acc caa ggc att gcc aac   6672
Ala Val Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Gly Ile Ala Asn
   2210                2215                2220

gca acc aat gag ctt gac cat cgt atc cac caa aac gaa aat aaa gcc   6720
Ala Thr Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala
2225                2230                2235                2240

aat gca ggg att tca tca gcg atg gcg atg gcg tcc atg cca caa gcc   6768
Asn Ala Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala
                2245                2250                2255

tac att cct ggc aga tcc atg gtt acc ggg ggt att gcc acc cac aac   6816
Tyr Ile Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn
           2260                2265                2270

ggt caa ggt gcg gtg gca gtg gga ctg tcg aag ctg tcg gat aat ggt   6864
Gly Gln Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly
       2275                2280                2285

caa tgg gta ttt aaa atc aat ggt tca gcc gat acc caa ggc cat gta   6912
Gln Trp Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val
   2290                2295                2300
```

FIG.5Y

```
ggg gcg gca gtt ggt gca ggt ttt cac ttt                    6942
Gly Ala Ala Val Gly Ala Gly Phe His Phe
2305                2310
```

FIG.6A

Alignment of amino acid sequence of 200kDa proteins of M. catarrhalis strains

```
        10         20         30         40         50         60    ...
MNHIYKVIFNKATGTFMAVAEYAKSHSTGGGSCATGQVGSVCTLSFARIAALAVLVIGATLSGS...
.........................................R.....................N.....
.....................C.....G.SS.STA.....SPVIRLT.V.T..I.......N.....
                                  ...    70         80          90       100
                                  ...AYAQKKDTKHIAIGEQNQPRRS--GTAKADGDRAIAIG            4223
                                  ......QIT..-.E..QT.KINNTLK.D.L.T.EAS..F.             Q8
                                  .......NNSK--..F.TTGNNDNA-----S.SNEAS....            LES-1

       110        120        130        140        150        160    ...
ENANAQGGQAIAIGSSNKTVNGSSLD-KIGTDATGQESIAIGGDVKASGDASIAIGSDDLHLLD...
SLSK...S.......VKPDP.NG.NG-NV.SH.K.N.........L.E............Y.PK...
SL.K.HAN......G.KPDPRNQAANQ.A.SH.K.K.........L.E............Y.DR...
                                  ...    170        180        190       200
                                  ...QHGNPKHPKGTLINDLINGHAVLKEIRSSKDNDVKYR             4223
                                  ...NLDL-.NEFHK----..H..EI..K.QT.T.GKI...             Q8
                                  ...NST.S.Y.N.L.ST-..QN.T..RQ..D.NGSQ-...             LES-1

       210        220        230        240        250        260    ...
RTTASGHASTAVGAMSYAQGHFSNAFGTRATAKSAYSLAVGLAATAEGQSTIAIGSDATSSSLG...
..R.Q.....................Y...EA.........Q.TK..S..V..N.KANAFA...
..A.E.........A..K...A......S..EGN.......T.K..KGY......N.QAINY....
```

FIG.6B

```
                              ...   270        280        290        300
                              ...AIALGAGTRAQLQGSIALGQGSVVTQSDNN-SRPAYT              4223
                              ....T.I.GN.VVN.GRGV...F..QILDR...TDAS..V              Q8
                              ....L....D..VD.DYG....Y..QILNNN..NNNK..V              LES-1

       310        320             330        340        350       ...
PNTQALDPKFQ--ATNNTKAGPL-SIG-SN----SIKRKIINVGAGVNKTDAVNVAQLEAVVKW...
.LGKT.ADQYK--..RQGDSTDIF...N..NNNS..R.........SRD.........KL.EEL...
.EGNGSNIKSS-K..----GNG.F...-----SST...........YED.........K..ENL...
                              ... 360        370        380        390          400
                              ...AKERRITFQGD-DN-STDVKIGLDNTLTIKGGAETNA--LTDNN-IGVV  4223
                              ....-N.K...K..G..N.NS.ER..G.......D.Q...--..EA.-....  Q8
                              .....-.Q...K..-..-G.G..KK.GE.......-..Q.DK.....N....  LES-1

       410        420        430        440        450        460     ...
KEADNSGLKVKLAKTLNNLTEVNTTTLNATTTVKVGSSSSTTAELLSDSLTFTQPNTGSQSTSK...
TDGN--.........E.TG..S.-----S..NKIT.SNTNNNN...Q.GG...S-.I..TK-.D....
TDNN-T.........N.SG.ET.S.KN.T.SEK.T...GNN-....Q.GG....-.T.NA-..D....
                              ...   470        480        490        500
                              ...TVYGVNGVKFTNNAETTAAIGTTRITRDKIGFARDG               4223
                              ......SID.L....DSNSI.TK......KK.....GTN              Q8
                              .......TD.L...D.SN.ALED-.....K.....SNKA              LES-1
```

FIG.6C

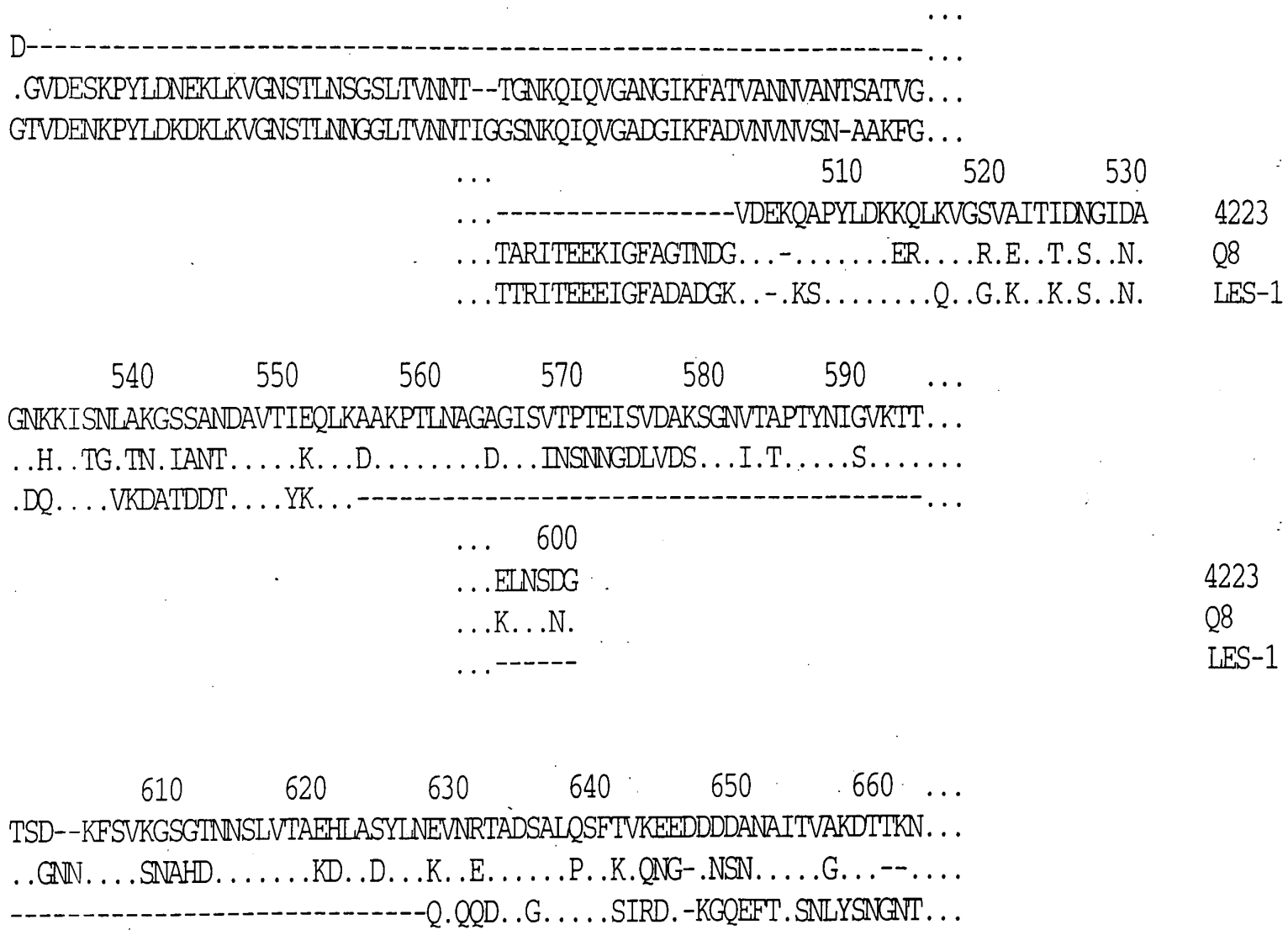


FIG.6D

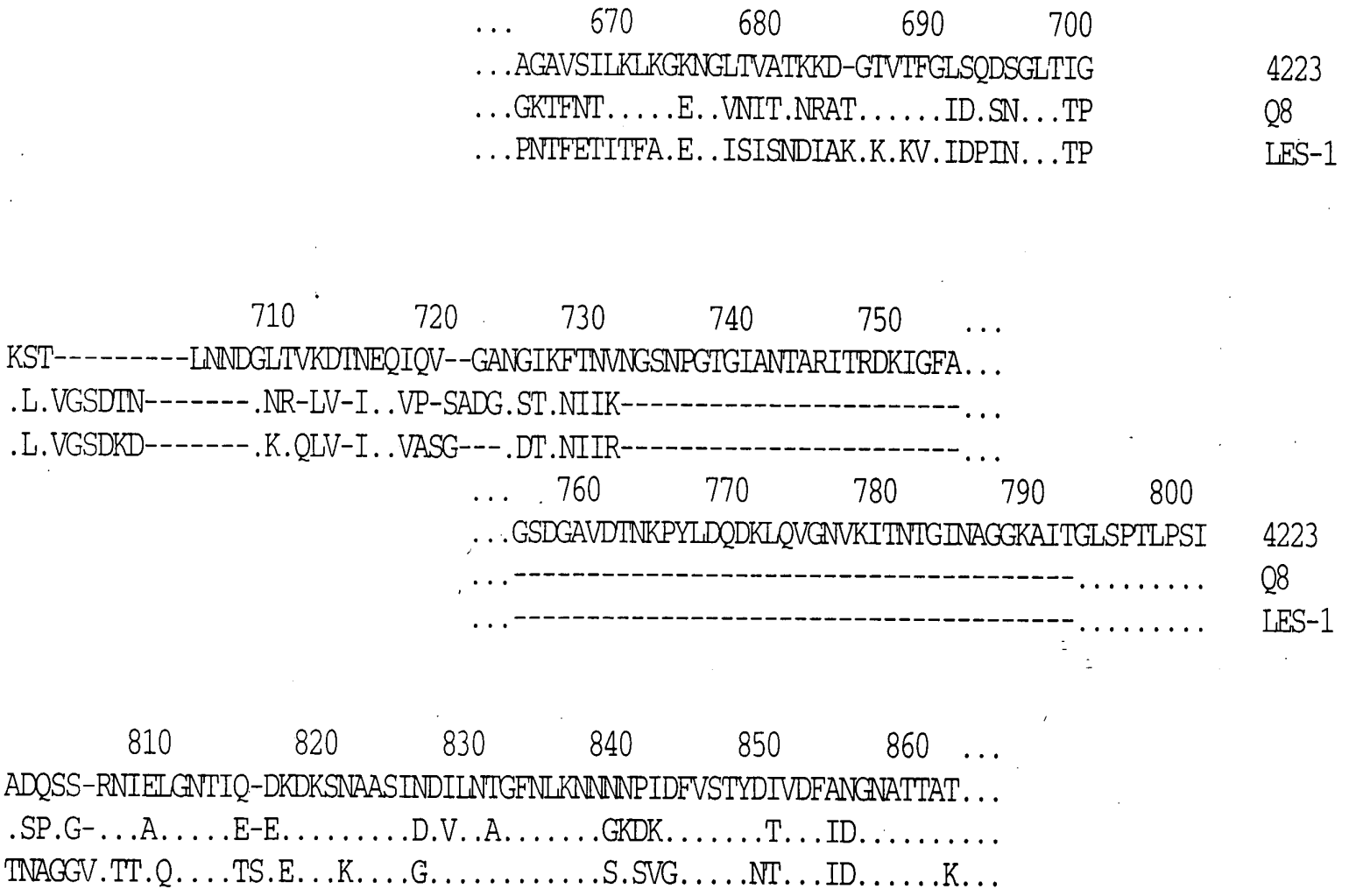


FIG.6E


```
                              ...      870        880        890          900
                              ...VTHDTANKTSKVVYDVNVDDTTIHLTGTDDNKK---LGVKT          4223
                              .....Y.E..Q....A......EK..E...--..G.KQ-.....          Q8
                              .....Y.ET.Q....T......EK..E...--..G.TNKI....          LES-1

       910        920        930        940        950        960   ...
TKLNKTSANGNTATNFNVNSSDED-ALVNAKDIAENLNTLAKEIHTTKGTADTALQTFTVKKVD...
I..TE..T...-..T.---.T.D.H...K.S...G......E.........N..............
.T.TT.N...K-....--STT.N.-.....................................K...--...
                              ...     970        980         990      1000
                              ...ENNNADDANAITVGQKNANNQ--VNTLTLKGENGLNIKT          4223
                              .....DK...T......KDGTSGK--....K...K...D...          Q8
                              ...--DG.T.DET....KDGTQ.GKT....K.......TVA.          LES-1

      1010       1020       1030       1040       1050       1060   ...
DKNGTVTFGINTTSGLKAGKST-LNDGGLSIKNPTGSEQIQVGADGVKFAKVNNNGVVGAGIDG...
..D.........Q......D..T..NN......TASN.............M...-...........
N.D.........Q......D..T..KD.......ASN...............DK-.NSST.......
                              ...   1070       1080       1090       1100
                              ...TTRITRDEIGFTGTNGSLDKSKPHLSKDGINAGGKKI----------          4223
                              .....----------          Q8
                              ...S...K.Q.....A.....TT....T..KLKV.EVE.TNIGINAGGKKI          LES-1
```

FIG.6F

```
     1110       1120       1130       1140       1150       1160     ...
TNIQSGEIAQNSHDAVTGGKIYDLKTELENKISSTAKTAQNSLHEFSVADEQGNNFTVSNPYSS...
.........K.....................................................
......D.T...N......RV........S..N.A...................H...........
                                ...  1170       1180       1190       1200
                                ...YDTSKTSDVITFAGENGITTKVNKGVVRVGIDQTKG          4223
                                ....................................             Q8
                                ....................................             LES-1

     1210       1220       1230       1240       1250       1260     ...
LTTPKLTVGNNNGKGIVIDSQNGQNTITGLSNTLANVTNDKGSVRTTEQGNIIKDEDKTRAASI...
..................N.....................................................
....................KD..................-.AGHALS..LAN-.T...........
                                ...  1270       1280       1290       1300
                                ...VDVLSAGFNLQGNGEAVDFVSTYDIVNFADGNATTA          4223
                                ..............................N..T...             Q8
                                ...G...N.....................D.I.......             LES-1
```

FIG.6G

```
      1310       1320       1330       1340       1350       1360   ...
KVTYDDTSKTSKVVYDVNVDDTTIEVK-DKKLGVKTTTLTSTGTGANKFALSNQATGDALVKAS...
.........................-.....................................
....................NK....TS.............K.SANG.ATKF.A-.D..........
                                ...   1370       1380       1390       1400
                                ...DIVAHLNTLSGDIQTAKGASQANNSAGYVDADGNKVI          4223
                                .....................................             Q8
                                .....AT.....A............SS..S.........          LES-1

      1410       1420       1430       1440       1450       1460   ...
YDSTDNKYYQAKNDGTVDKTKEVAKDKLVAQAQTPDGTLAQMNVKSVINKEQVNDANKKQGINE...
.....................................................................
.....K....VNDK.Q...N.................................................
                                ...   1470       1480       1490       1500
                                ...DNAFVKGLEKAASDNKTKNAAVTVGDLNAVAQTPLT          4223
                                .....................................             Q8
                                .......I....N..K.T...................             LES-1
```

FIG.6H

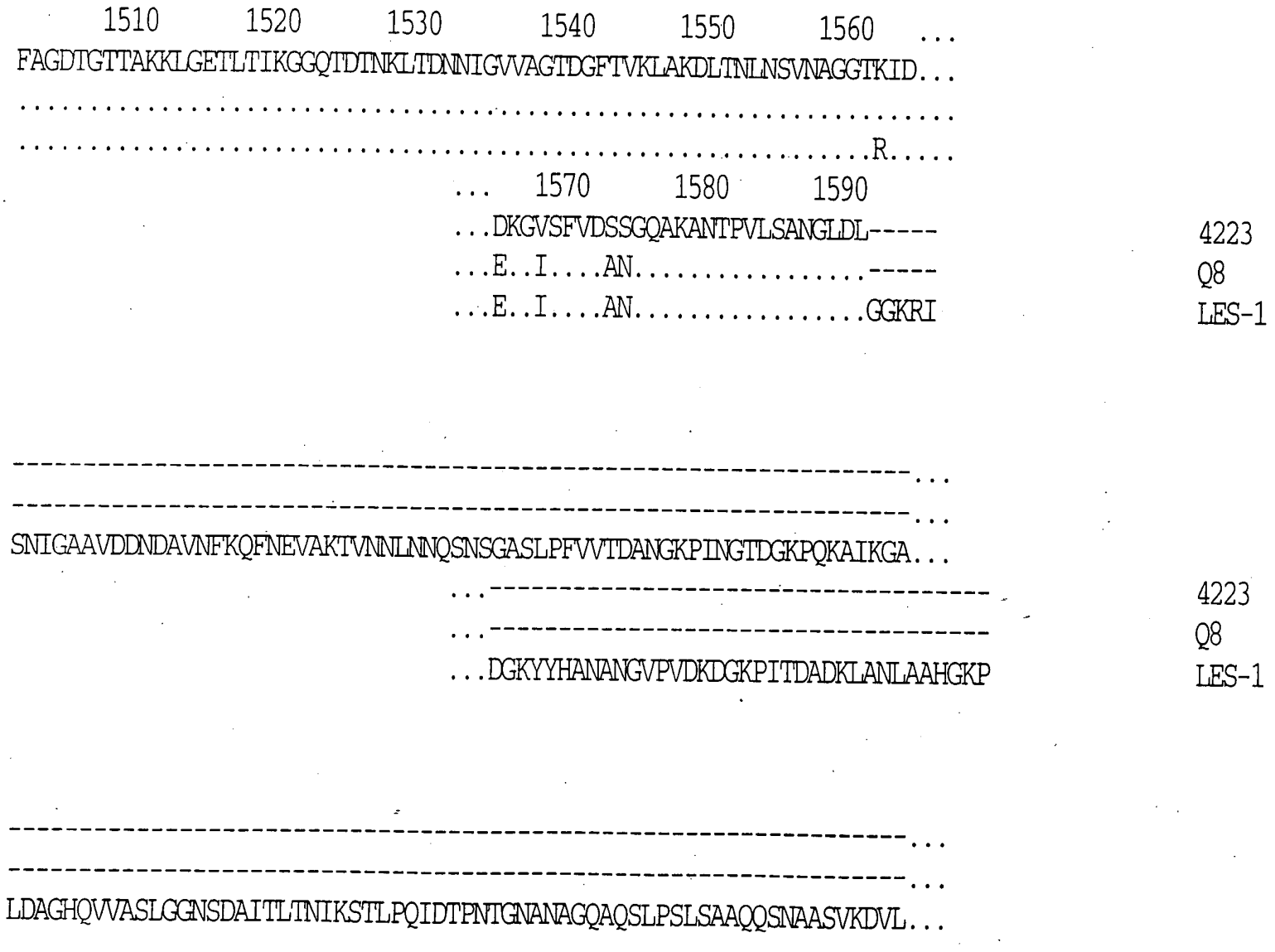


FIG.6I

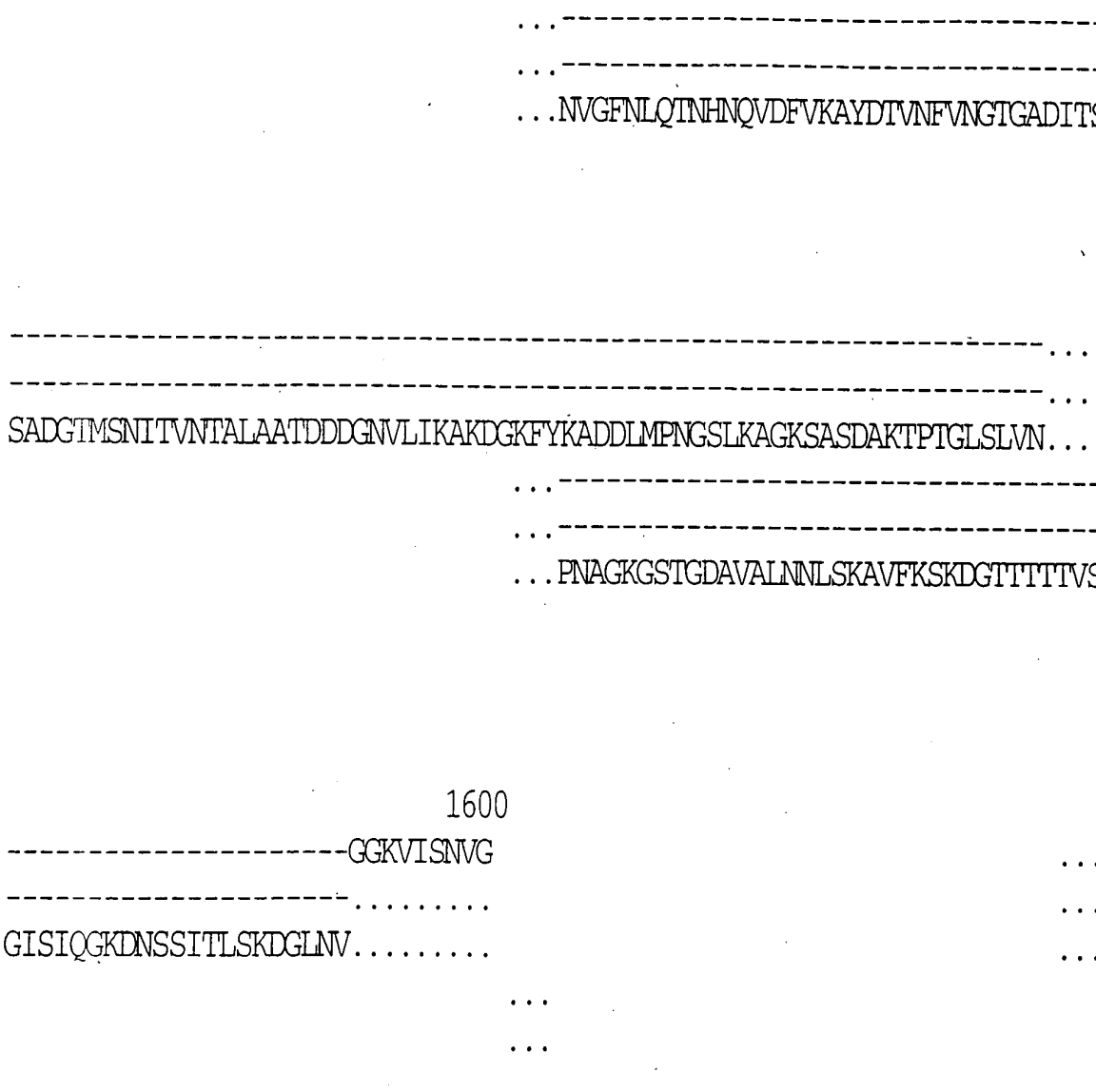


FIG.6J

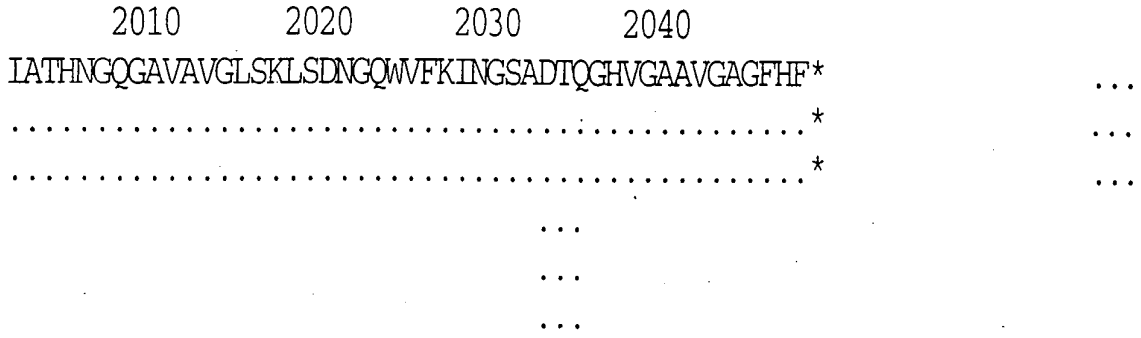
```
     1610       1620       1630       1640       1650       1660      ...
KGTKDTDAANVQQLNEVRNLLGLGNAGNDNADGNQVNIADIKKDPNSGSSSNRTVIKAGTVLGG...
.........................---.....................................
.....................................................................
                              ...  1670       1680       1690       1700
                              ...KGNNDTEKLATGGIQVGVDKDGNANGDLSNVWVKTQ          4223
                              ................V.....................          Q8
                              ................V.....................          LES-1

     1710       1720       1730       1740       1750       1760      ...
KDGSKKALLATYNAAGQTNYLTNNPAEAIDRINEQGIRFFHVNDGNQEPVVQGRNGIDSSASGK...
.....................V.....................................................
.....................................................................
                              ...  1770       1780       1790       1800
                              ...HSVAIGFQAKADGEAAVAIGRQTQAGNQSIAIGDNA          4223
                              ...................................              Q8
                              ...................................              LES-1
```

FIG.6K

```
      1810       1820       1830       1840       1850       1860     ...
QATGDQSIAIGTGNVVAGKHSGAIGDPSTVKADNSYSVGNNNQFTDATQTDVFGVGNNITVTES...
.....................................................................
.................T.............................I.....................
                                ...  1870       1880       1890       1900
                                ...NSVALGSNSAISAGTHAGTQAKKSDGTAGTTTTAGA      4223
                                .....................................        Q8
                                .....................................        LES-1
```

```
      1910       1920       1930       1940       1950       1960     ...
TGTVKGFAGQTAVGAVSVGASGAERRIQNVAAGEVSATSTDAVNGSQLYKATQSIANATNELDH...
.....................................................................
.....................................................G.............
                                ...  1970       1980       1990       2000
                                ...RIHQNENKANAGISSAMAMASMPQAYIPGRSMVTGG      4223
                                .....................................        Q8
                                .....................................        LES-1
```

FIG.6L



4223
Q8
LES-1

Construction of Plasmids Expressing Portions of the 200 kDa Protein Gene from Strain 4223

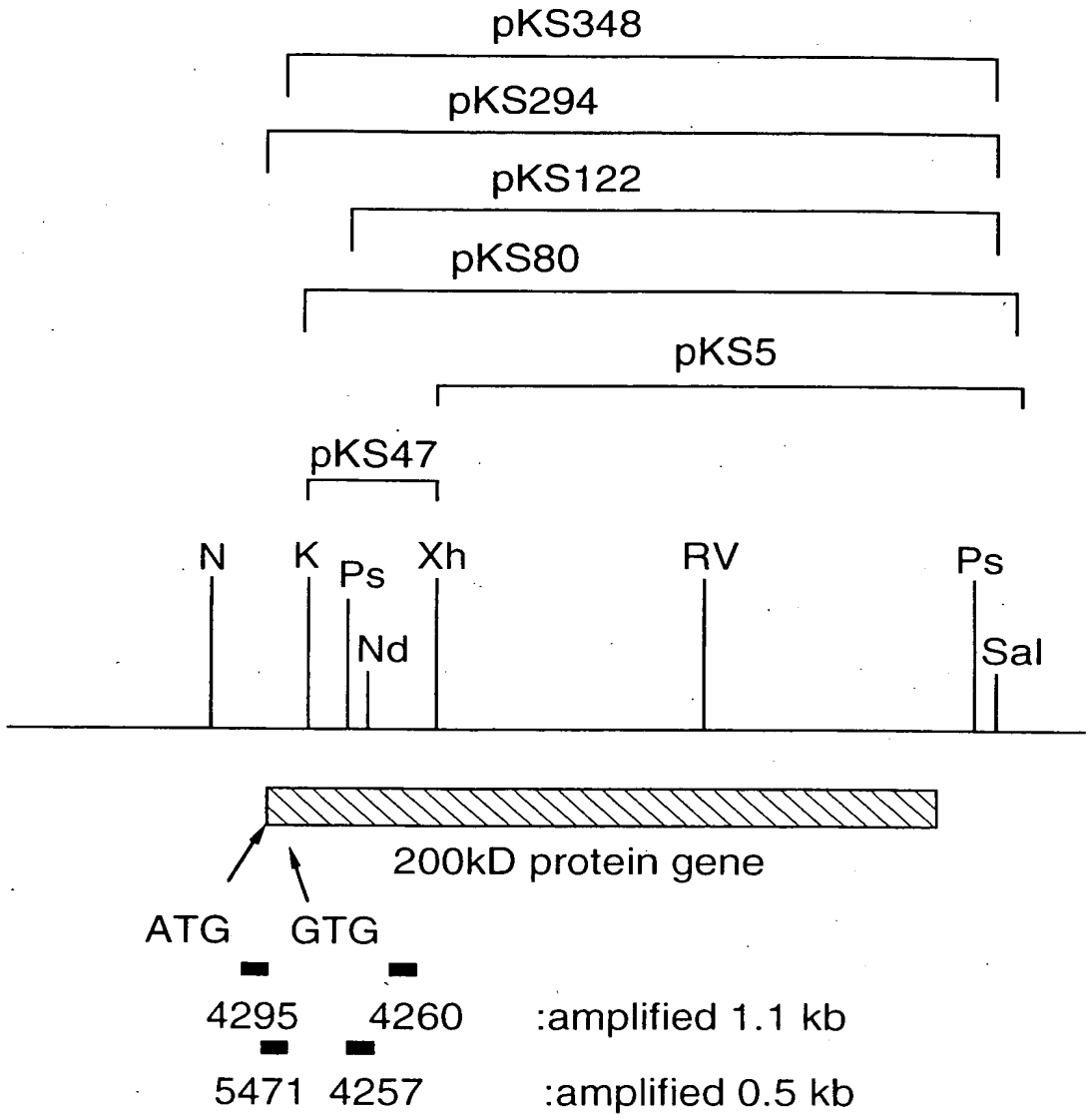


FIG.7

FIG.8A

M. catarrhalis M56 200kDa gene in pKS348.

```
ATG atc ggt gca acg ctc agt ggc agt gct tat gct caa aaa aaa gat   48
Met Ile Gly Ala Thr Leu Ser Gly Ser Ala Tyr Ala Gln Lys Lys Asp
  1               5                  10                  15

acc aaa cat atc gca att ggt gaa caa aac cag cca aga cgc tca ggc   96
Thr Lys His Ile Ala Ile Gly Glu Gln Asn Gln Pro Arg Arg Ser Gly
            20                  25                  30

act gcc aag gcg gac ggt gat cga gcc att gct att ggt gaa aat gct  144
Thr Ala Lys Ala Asp Gly Asp Arg Ala Ile Ala Ile Gly Glu Asn Ala
        35                  40                  45

aac gca cag ggc ggt caa gcc atc gcc atc ggt agt agt aat aaa act  192
Asn Ala Gln Gly Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr
    50                  55                  60

gtc aat gga agc agt ttg gat aag ata ggt acc gat gct acg ggt caa  240
Val Asn Gly Ser Ser Leu Asp Lys Ile Gly Thr Asp Ala Thr Gly Gln
65                  70                  75                  80
```

FIG.8B

```
gag tcc atc gcc atc ggt ggt gat gta aag gct agt ggt gat gcc tcg   288
Glu Ser Ile Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser
                85                  90                  95

att gcc atc ggt agt gat gac tta cat ttg ctt gat cag cat ggt aat   336
Ile Ala Ile Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn
            100                 105                 110

cct aaa cat ccg aaa ggt act ctg att aac gat ctt att aac ggc cat   384
Pro Lys His Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His
        115                 120                 125

gca gta tta aaa gaa ata cga agc tca aag gat aat gat gta aaa tat   432
Ala Val Leu Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr
    130                 135                 140

aga cgc aca acc gca agc gga cac gcc agt act gca gtg gga gcc atg   480
Arg Arg Thr Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met
145                 150                 155                 160

tca tat gca cag ggt cat ttt tcc aac gcc ttt ggt aca cgg gca aca   528
Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr
                165                 170                 175
```

FIG.8C

```
gct aaa agt gcc tat tcc ttg gca gtg ggt ctt gcc gcc aca gcc gag   576
Ala Lys Ser Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu
            180                 185                 190

ggc caa tct aca atc gct att ggt tct gat gca aca tct agc tcg ttg   624
Gly Gln Ser Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu
        195                 200                 205

gga gcg ata gcc ctt ggt gca ggt act cgt gct cag cta cag ggc agt   672
Gly Ala Ile Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser
    210                 215                 220

att gcc cta ggt caa ggt tct gtt gtc act cag agt gat aat aat tct   720
Ile Ala Leu Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser
225                 230                 235                 240

aga ccg gcc tat aca cca aat acc cag gca cta gac ccc aag ttt caa   768
Arg Pro Ala Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln
                245                 250                 255

gcc acc aat aat acg aag gcg ggt cca ctt tcc att ggt agt aac tct   816
Ala Thr Asn Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser
            260                 265                 270
```

FIG.8D

```
atc aaa cgt aaa atc atc aat gtc ggt gca ggt gtt aat aaa acc gat   864
Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp
        275                 280                 285

gcg gtc aat gtg gca cag cta gaa gcg gtg gtg aag tgg gct aag gag   912
Ala Val Asn Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu
    290                 295                 300

cgt aga att act ttt cag ggt gat gat aac agt act gac gta aaa ata   960
Arg Arg Ile Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile
305                 310                 315                 320

ggt ttg gat aat act tta act att aaa ggt ggt gca gag acc aac gca   1008
Gly Leu Asp Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala
                325                 330                 335

tta acc gat aat aat atc ggt gtg gta aaa gag gct gat aat agt ggt   1056
Leu Thr Asp Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly
            340                 345                 350

ctg aaa gtt aaa ctt gct aaa act tta aac aat ctt act gag gtg aat   1104
Leu Lys Val Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn
        355                 360                 365
```

FIG.8E

```
aca act aca tta aat gcc aca acc aca gtt aag gta ggt agt agt agt   1152
Thr Thr Thr Leu Asn Ala Thr Thr Thr Val Lys Val Gly Ser Ser Ser
    370                 375                 380

agt act aca gct gaa tta ttg agt gat agt tta acc ttt acc cag ccc   1200
Ser Thr Thr Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro
385                 390                 395                 400

aat aca ggc agt caa agc aca agc aaa acc gtc tat ggc gtt aat ggg   1248
Asn Thr Gly Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly
                405                 410                 415

gtg aag ttt act aat aat gca gaa aca aca gca gca atc ggc act act   1296
Val Lys Phe Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr
            420                 425                 430

cgt att acc aga gat aaa att ggc ttt gct cga gat ggt gat gtt gat   1344
Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp
        435                 440                 445

gaa aaa caa gca cca tat ttg gat aaa aaa caa ctt aaa gtg ggt agt   1392
Glu Lys Gln Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser
    450                 455                 460
```

FIG.8F

```
gtt gca att acc ata gac aat ggc att gat gca ggt aat aaa aag atc   1440
Val Ala Ile Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile
465                 470                 475                 480

agt aat ctt gcc aaa ggt agc agt gct aac gat gcg gtt acc atc gaa   1488
Ser Asn Leu Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu
                485                 490                 495

cag ctc aaa gcc gcc aag cct act tta aac gca ggc gct ggc atc agt   1536
Gln Leu Lys Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser
            500                 505                 510

gtc aca cct act gaa ata tca gtt gat gct aag agt ggc aat gtt acc   1584
Val Thr Pro Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr
        515                 520                 525

gcc cca act tac aac att ggc gtg aaa acc acc gag ctt aac agt gat   1632
Ala Pro Thr Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp
    530                 535                 540

ggc act agt gat aaa ttt agt gtt aag ggt agt ggt acg aac aat agc   1680
Gly Thr Ser Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser
545                 550                 555                 560
```

FIG.8G

```
tta gtt acc gcc gaa cat ttg gca agc tat cta aat gaa gtc aat cga   1728
Leu Val Thr Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg
                565                 570                 575

acg gct gac agt gct cta caa agc ttt acc gtt aaa gaa gaa gac gat   1776
Thr Ala Asp Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp
            580                 585                 590

gat gac gcc aac gct atc acc gtg gct aaa gat acg aca aaa aat gcc   1824
Asp Asp Ala Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala
        595                 600                 605

ggc gca gtc agc atc tta aaa ctc aaa ggt aaa aac ggt cta acg gtt   1872
Gly Ala Val Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val
    610                 615                 620

gct acc aaa aaa gat ggt acg gtt acc ttt ggg ctt agc caa gat agc   1920
Ala Thr Lys Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser
625                 630                 635                 640

ggt ctg acc att ggc aaa agc acc cta aac aac gat ggc ttg act gtt   1968
Gly Leu Thr Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val
                645                 650                 655
```

FIG.8H

```
aaa gat acc aac gaa caa atc caa gtc ggt gct aat ggc att aaa ttt   2016
Lys Asp Thr Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe
            660                 665                 670

act aat gtg aat ggt agt aat cca ggt act ggc att gca aat acc gct   2064
Thr Asn Val Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala
        675                 680                 685

cgc att acc aga gat aaa att ggc ttt gct ggt tct gat ggt gca gtt   2112
Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val
    690                 695                 700

gat aca aac aaa cct tat ctt gat caa gac aag cta caa gtt ggc aat   2160
Asp Thr Asn Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn
705                 710                 715                 720

gtt aag att acc aac act ggc att aac gca ggt ggt aaa gcc atc aca   2208
Val Lys Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr
                725                 730                 735

ggg ctg tcc cca aca ctg cct agc att gcc gat caa agt agc cgc aac   2256
Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn
            740                 745                 750
```

FIG.8I

```
ata gaa ctg ggc aat aca atc caa gac aaa gac aaa tcc aac gct gcc   2304
Ile Glu Leu Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala
        755                 760                 765

agc att aat gat ata tta aat aca ggc ttt aac cta aaa aat aat aac   2352
Ser Ile Asn Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn
    770                 775                 780

aac ccc att gac ttt gtc tcc act tat gac att gtt gac ttt gcc aat   2400
Asn Pro Ile Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn
785                 790                 795                 800

ggc aat gcc acc acc gcc aca gta acc cat gat acc gct aac aaa acc   2448
Gly Asn Ala Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr
                805                 810                 815

agt aaa gtg gta tat gat gtg aat gtg gat gat aca acc att cat cta   2496
Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu
            820                 825                 830

aca ggc act gat gac aat aaa aaa ctt ggc gtc aaa acc acc aaa ctg   2544
Thr Gly Thr Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu
        835                 840                 845
```

FIG.8J

```
aac aaa aca agt gct aat ggt aat aca gca act aac ttt aat gtt aac   2592
Asn Lys Thr Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn
    850                 855                 860

tct agt gat gaa gat gcc ctt gtt aac gcc aaa gac atc gcc gaa aat   2640
Ser Ser Asp Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn
865                 870                 875                 880

cta aac acc cta gcc aag gaa att cac acc acc aaa ggc aca gca gac   2688
Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp
                885                 890                 895

acc gcc cta caa acc ttt acc gtt aaa aag gta gat gaa aat aat aat   2736
Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn
            900                 905                 910

gct gat gac gcc aac gcc atc acc gtg ggt caa aag aac gca aat aat   2784
Ala Asp Asp Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn
        915                 920                 925

caa gtc aac acc cta aca ctc aaa ggt gaa aac ggt ctt aat att aaa   2832
Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys
    930                 935                 940
```

FIG.8K

```
acc gac aaa aat ggt acg gtt acc ttt ggc att aac acc aca agc ggt   2880
Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly
945                 950                 955                 960

ctt aaa gcc ggc aaa agc acc cta aac gac ggt ggc ttg tct att aaa   2928
Leu Lys Ala Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys
                965                 970                 975

aac ccc act ggt agc gaa caa atc caa gtc ggt gct gat ggc gtg aag   2976
Asn Pro Thr Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys
            980                 985                 990

ttt gcc aag gtt aat aat aat ggt gtt gta ggt gct ggc att gat ggc   3024
Phe Ala Lys Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly
        995                1000                1005

aca act cgc att acc aga gat gaa att ggc ttt act ggg act aat ggc   3072
Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly
   1010                1015                1020

tca ctt gat aaa agc aaa ccc cac cta agc aaa gac ggc att aac gca   3120
Ser Leu Asp Lys Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala
1025                1030                1035                1040
```

FIG.8L

```
ggt ggt aaa aag att acc aac att caa tca ggt gag att gcc caa aac   3168
Gly Gly Lys Lys Ile Thr Asn Ile Gln Ser Gly Glu Ile Ala Gln Asn
                1045                1050                1055

agc cat gat gct gtg aca ggc ggc aag att tat gat tta aaa acc gaa   3216
Ser His Asp Ala Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu
            1060                1065                1070

ctt gaa aac aaa atc agc agt act gcc aaa aca gca caa aac tca tta   3264
Leu Glu Asn Lys Ile Ser Ser Thr Ala Lys Thr Ala Gln Asn Ser Leu
        1075                1080                1085

cac gaa ttc tca gta gca gat gaa caa ggt aat aac ttt acg gtt agt   3312
His Glu Phe Ser Val Ala Asp Glu Gln Gly Asn Asn Phe Thr Val Ser
    1090                1095                1100

aac cct tac tcc agt tat gac acc tca aag acc tct gat gtc atc acc   3360
Asn Pro Tyr Ser Ser Tyr Asp Thr Ser Lys Thr Ser Asp Val Ile Thr
1105                1110                1115                1120

ttt gca ggt gaa aac ggc att acc acc aag gta aat aaa ggt gtg gtg   3408
Phe Ala Gly Glu Asn Gly Ile Thr Thr Lys Val Asn Lys Gly Val Val
                1125                1130                1135
```

FIG.8M

```
cgt gtg ggc att gac caa acc aaa ggc tta acc acg cct aag ctg acc   3456
Arg Val Gly Ile Asp Gln Thr Lys Gly Leu Thr Thr Pro Lys Leu Thr
          1140                1145                1150

gtg ggt aat aat aat ggc aaa ggc att gtc att gac agc caa aat ggt   3504
Val Gly Asn Asn Asn Gly Lys Gly Ile Val Ile Asp Ser Gln Asn Gly
       1155                1160                1165

caa aat acc atc aca gga cta agc aac act cta gct aat gtt acc aat   3552
Gln Asn Thr Ile Thr Gly Leu Ser Asn Thr Leu Ala Asn Val Thr Asn
   1170                1175                1180

gat aaa ggt agc gta cgc acc aca gaa cag ggc aat ata atc aaa gac   3600
Asp Lys Gly Ser Val Arg Thr Thr Glu Gln Gly Asn Ile Ile Lys Asp
1185                1190                1195                1200

gaa gac aaa acc cgt gcc gcc agc att gtt gat gtg cta agc gca ggc   3648
Glu Asp Lys Thr Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly
               1205                1210                1215

ttt aac ttg caa ggc aat ggt gaa gcg gtt gac ttt gtc tcc act tat   3696
Phe Asn Leu Gln Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr
          1220                1225                1230
```

FIG.8N

```
gac acc gtc aac ttt gcc gat ggc aat gcc acc acc gct aag gtg acc   3744
Asp Thr Val Asn Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr
       1235                1240                1245

tat gat gac aca agc aaa acc agt aaa gtg gtc tat gat gtc aat gtg   3792
Tyr Asp Asp Thr Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val
   1250                1255                1260

gat gat aca acc att gaa gtt aaa gat aaa aaa ctt ggc gta aaa acc   3840
Asp Asp Thr Thr Ile Glu Val Lys Asp Lys Lys Leu Gly Val Lys Thr
1265                1270                1275                1280

acc aca ttg acc agt act ggc aca ggt gct aat aaa ttt gcc cta agc   3888
Thr Thr Leu Thr Ser Thr Gly Thr Gly Ala Asn Lys Phe Ala Leu Ser
                1285                1290                1295

aat caa gct act ggc gat gcg ctt gtc aag gcc agt gat atc gtt gct   3936
Asn Gln Ala Thr Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala
           1300                1305                1310

cat cta aac acc tta tct ggc gac atc caa act gcc aaa ggg gca agc   3984
His Leu Asn Thr Leu Ser Gly Asp Ile Gln Thr Ala Lys Gly Ala Ser
       1315                1320                1325
```

FIG.8O

```
caa gcg aac aac tca gca ggc tat gtg gat gct gat ggc aat aag gtc   4032
Gln Ala Asn Asn Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val
   1330                1335                1340

atc tat gac agt acc gat aac aag tac tat caa gcc aaa aat gat ggc   4080
Ile Tyr Asp Ser Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly
1345                1350                1355                1360

aca gtt gat aaa acc aaa gaa gtt gcc aaa gac aaa ctg gtc gcc caa   4128
Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln
                1365                1370                1375

gcc caa acc cca gat ggc aca ttg gct caa atg aat gtc aaa tca gtc   4176
Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val
            1380                1385                1390

att aac aaa gaa caa gta aat gat gcc aat aaa aag caa ggc atc aat   4224
Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn
       1395                1400                1405

gaa gac aac gcc ttt gtt aaa gga ctt gaa aaa gcc gct tct gat aac   4272
Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn
   1410                1415                1420
```

FIG.8P

```
aaa acc aaa aac gcc gca gta act gtg ggt gat tta aat gcc gtt gcc   4320
Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala
1425                1430                1435                1440

caa aca ccg ctg acc ttt gca ggg gat aca ggc aca acg gct aaa aaa   4368
Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys
                1445                1450                1455

ctg ggc gag act ttg acc atc aaa ggt ggg caa aca gac acc aat aag   4416
Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys
        1460                1465                1470

cta acc gat aat aac atc ggt gtg gta gca ggt act gat ggc ttc act   4464
Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr
    1475                1480                1485

gtc aaa ctt gcc aaa gac cta acc aat ctt aac agc gtt aat gca ggt   4512
Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly
1490                1495                1500

ggc acc aaa att gat gac aaa ggc gtg tct ttt gta gac tca agc ggt   4560
Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly
1505                1510                1515                1520
```

FIG.8Q

```
caa gcc aaa gca aac acc cct gtg cta agt gcc aat ggg ctg gac ctg   4608
Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu
                1525                1530                1535

ggt ggc aag gtc atc agt aat gtg ggc aaa ggc aca aaa gat acc gac   4656
Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp
            1540                1545                1550

gct gcc aat gta caa cag tta aac gaa gta cgc aac ttg ttg ggt ctt   4704
Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu
        1555                1560                1565

ggt aat gct ggt aat gat aac gct gac ggc aat cag gta aac att gcc   4752
Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala
    1570                1575                1580

gac atc aaa aaa gac cca aat tca ggt tca tca tct aac cgc act gtc   4800
Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val
1585                1590                1595                1600

atc aaa gca ggc acg gta ctt ggc ggt aaa ggt aat aac gat acc gaa   4848
Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu
                1605                1610                1615
```

FIG.8R

```
aaa ctt gcc act ggt ggt ata caa gtg ggc gtg gat aaa gac ggc aac   4896
Lys Leu Ala Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn
          1620                1625                1630

gct aac ggc gat tta agc aat gtt tgg gtc aaa acc caa aaa gat ggc   4944
Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly
       1635                1640                1645

agc aaa aaa gcc ctg ctc gcc act tat aac gcc gca ggt cag acc aac   4992
Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn
   1650                1655                1660

tat ttg acc aac aac ccc gca gaa gcc att gac aga ata aat gaa caa   5040
Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln
1665                1670                1675                1680

ggt atc cgc ttc ttc cat gtc aac gat ggc aat caa gag cct gtg gta   5088
Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val
               1685                1690                1695

caa ggg cgt aac ggc att gac tca agt gcc tca ggc aag cac tca gtg   5136
Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val
          1700                1705                1710
```

FIG.8S

```
gcg ata ggt ttc cag gcc aag gca gat ggt gaa gcc gcc gtt gcc ata   5184
Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile
      1715                1720                1725

ggc aga caa acc caa gca ggc aac caa tcc atc gcc atc ggt gat aac   5232
Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn
   1730                1735                1740

gca caa gcc acg ggc gat caa tcc atc gcc atc ggt aca ggc aat gtg   5280
Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val
1745                1750                1755                1760

gta gca ggt aag cac tct ggt gcc atc ggc gac cca agc act gtt aag   5328
Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys
               1765                1770                1775

gct gat aac agt tac agt gtg ggt aat aac aac cag ttt acc gat gcc   5376
Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala
           1780                1785                1790

act caa acc gat gtc ttt ggt gtg ggc aat aac atc acc gtg acc gaa   5424
Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu
      1795                1800                1805
```

FIG.8T

```
agt aac tcg gtt gcc tta ggt tca aac tct gcc atc agt gca ggc aca   5472
Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr
   1810                1815                1820

cac gca ggc aca caa gcc aaa aaa tct gac ggc aca gca ggt aca acc   5520
His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr
1825                1830                1835                1840

acc aca gca ggt gca acc ggt acg gtt aaa ggc ttt gct gga caa acg   5568
Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr
                1845                1850                1855

gcg gtt ggt gcg gtc tcc gtg ggt gcc tca ggt gct gaa cgc cgt atc   5616
Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile
          1860                1865                1870

caa aat gtg gca gca ggt gag gtc agt gcc acc agc acc gat gcg gtc   5664
Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val
       1875                1880                1885

aat ggt agc cag ttg tac aaa gcc acc caa agc att gcc aac gca acc   5712
Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr
   1890                1895                1900
```

FIG.8U

```
aat gag ctt gac cat cgt atc cac caa aac gaa aat aag gcc aat gca   5760
Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala
1905                1910                1915                1920

ggg att tca tca gcg atg gcg atg gcg tcc atg cca caa gcc tac att   5808
Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile
                1925                1930                1935

cct ggc aga tcc atg gtt acc ggg ggt att gcc acc cac aac ggt caa   5856
Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln
            1940                1945                1950

ggt gcg gtg gca gtg gga ctg tcg aag ctg tcg gat aat ggt caa tgg   5904
Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp
        1955                1960                1965

gta ttt aaa atc aat ggt tca gcc gat acc caa ggc cat gta ggg gcg   5952
Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala
    1970                1975                1980

gca gtt ggt gca ggt ttt cac ttt taagccataa atcgcaagat tttacttaaa   6006
Ala Val Gly Ala Gly Phe His Phe
1985                1990
```

FIG.8V

aatcaatctc accatagttg tataaaacag catcagcatc agtcatatta ctgatgctga 6066

tgtttttat cacttaaacc attttaccgc tcaagtgatt ctctttcacc atgaccaaat 6126

cgccattgat cataggtaaa cttattgagt aaattttatc aatgtagttg ttagatatgg 6186

ttaaaattgt gccattgacc aaaaaatgac cgatttatcc cgaaaatttc tgattatgat 6246

ccgttgacct gca 6259

Construction of pKS294

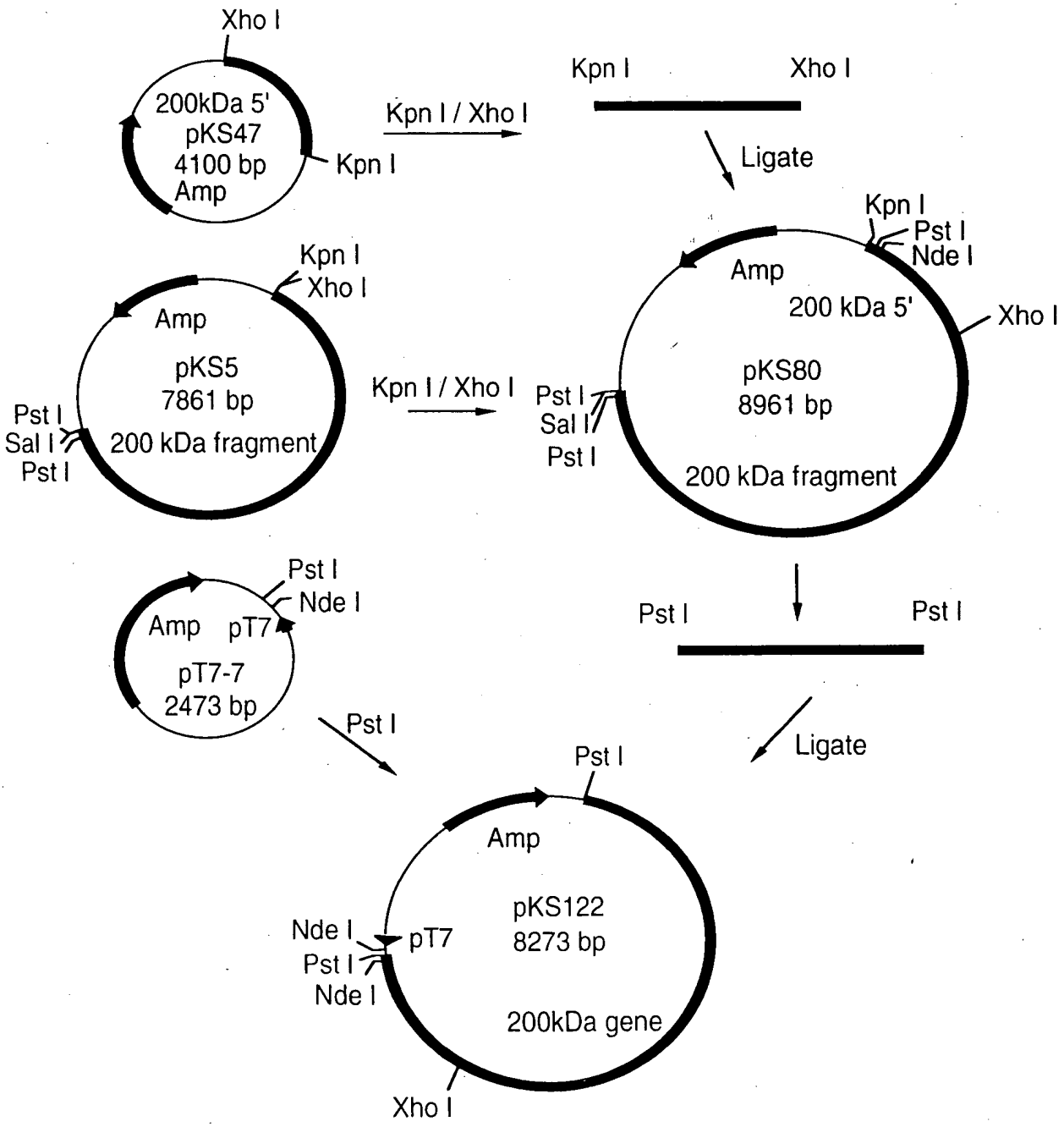


FIG.9A

Construction of pKS294

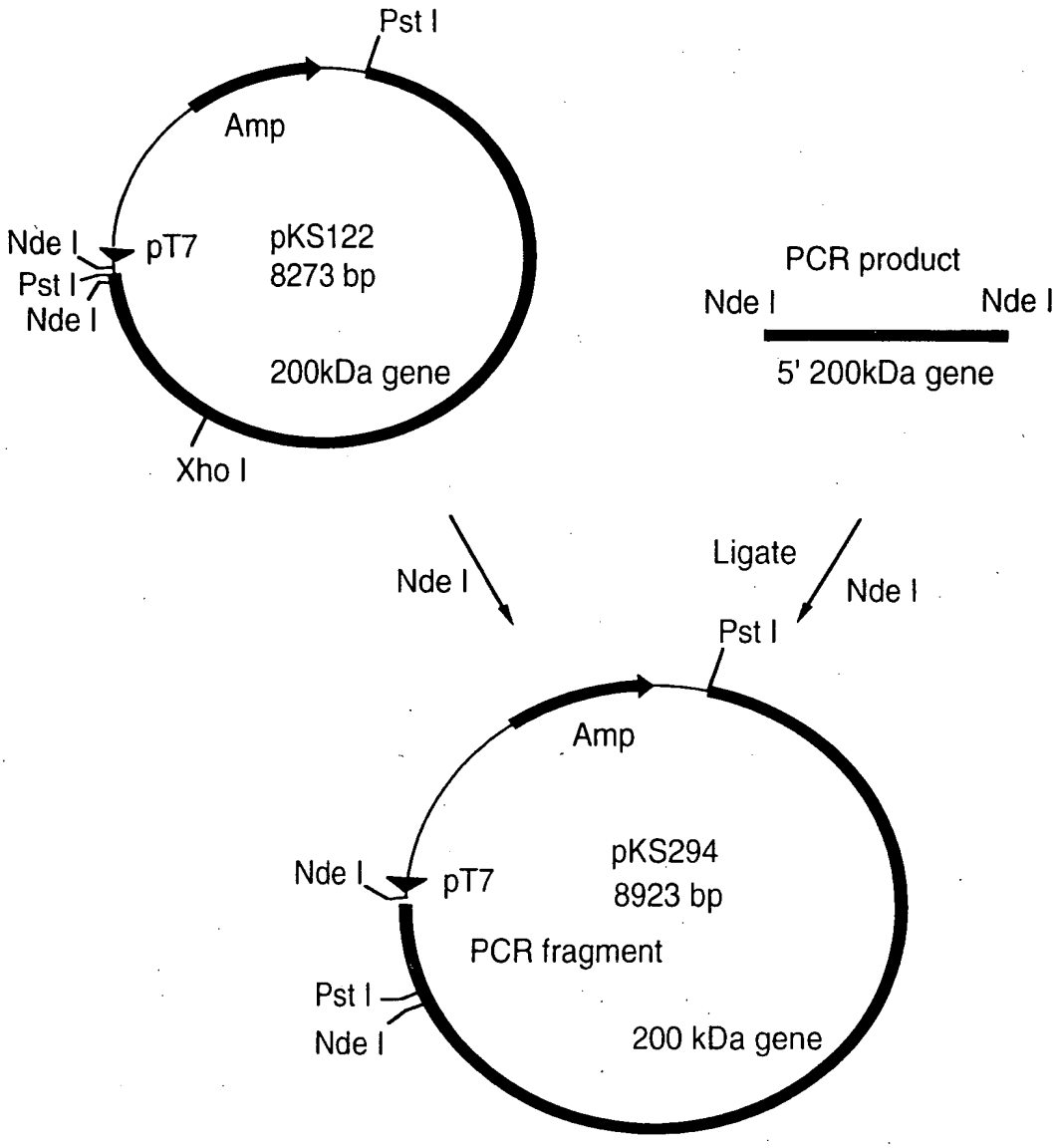


FIG.9B

Construction of pKS348

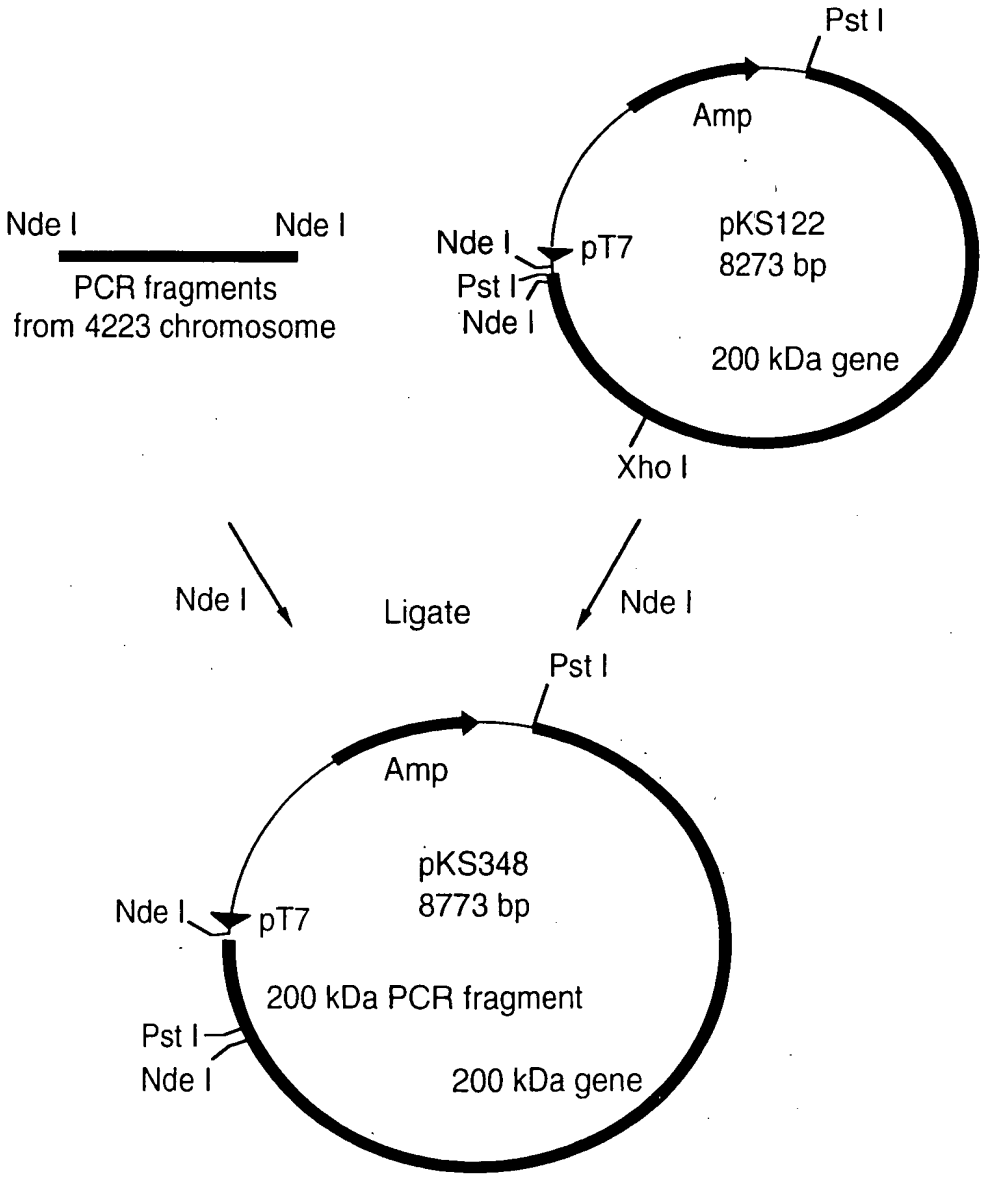


FIG.10

Purification of r200 kDa Protein from E. coli

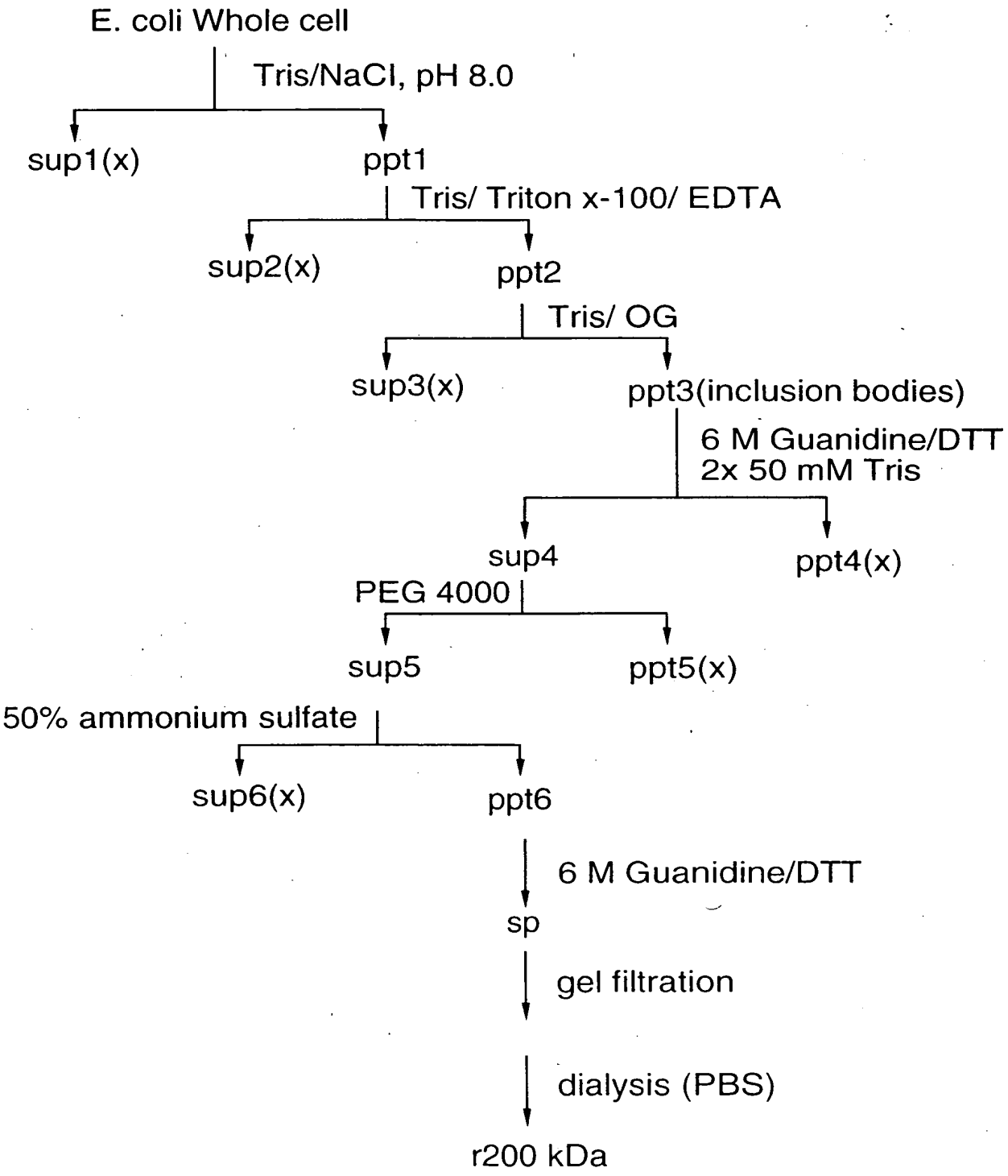
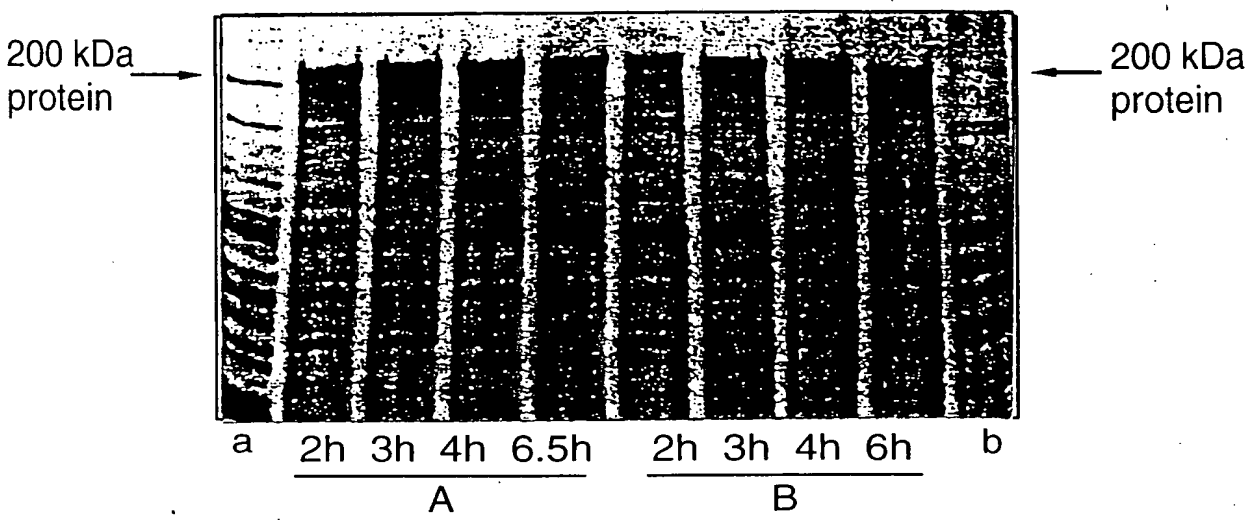


FIG.11

Expression of M 56 r200 kDa Protein Gene in E. coli



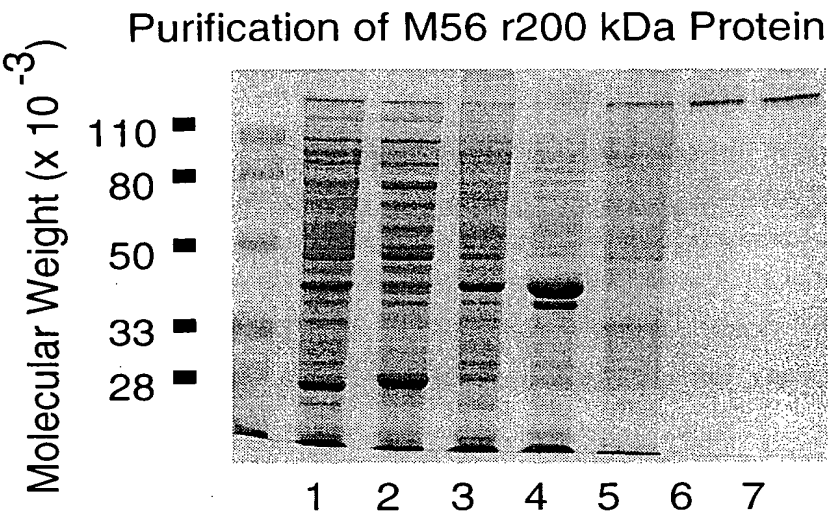
A: KS358 induced when O.D. at 600nm was 0.26

B: KS358 induced when O.D. at 600nm was 0.44

a: strain 4223 lysate

b: KS358 cultured overnight

FIG.12



1. E. coli Whole cells
2. Soluble proteins after 50mM Tris/ NaCl, pH 8, extraction
3. Soluble proteins after Tris/ Triton X-100/ EDTA extraction
4. Soluble proteins after Tris/ OG extraction
5. Pellet after Tris/ OG extraction

6-7. Purified 200 kDa protein

FIG.13

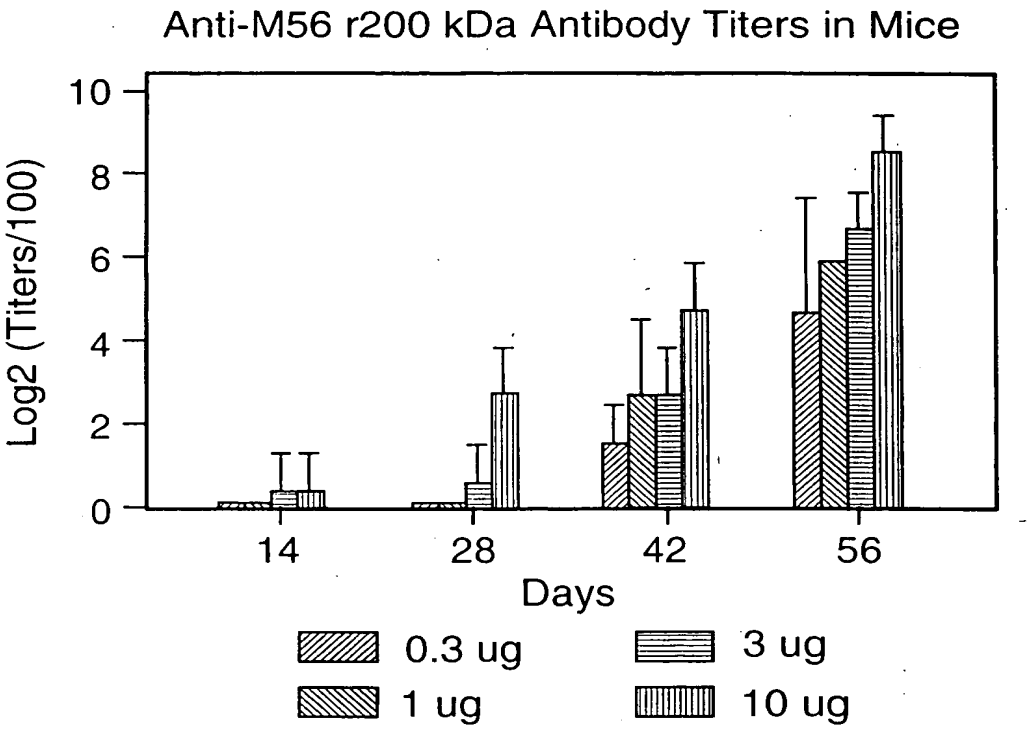


FIG.14

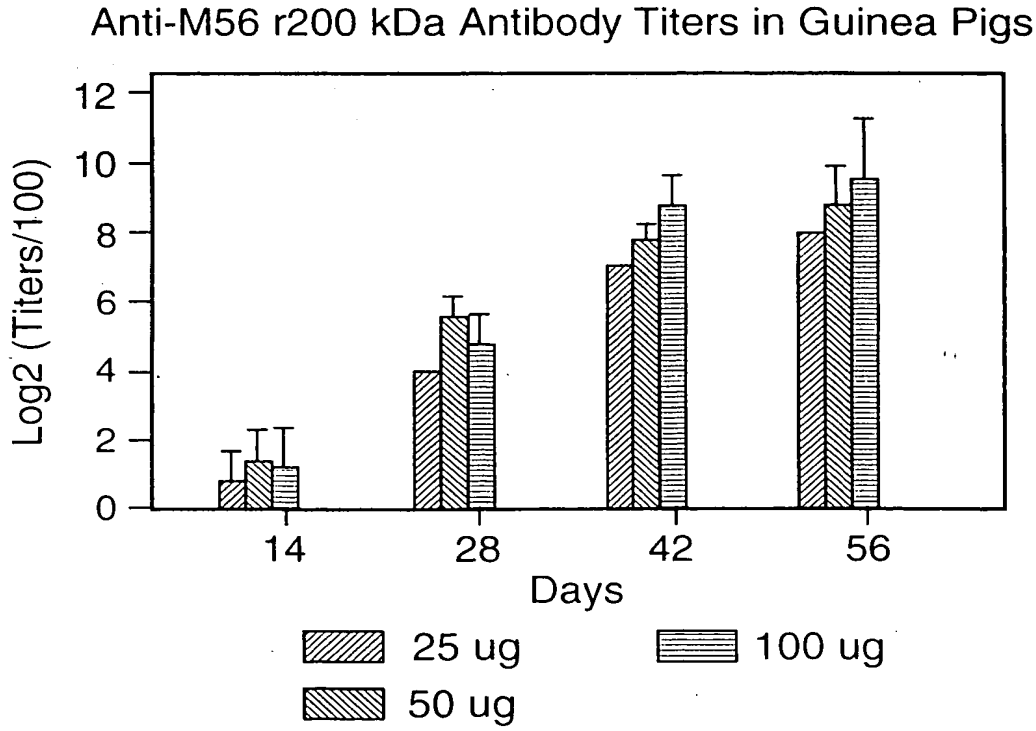


FIG.15

PCR amplification of DNA fragments carrying a portion of the 200 kDa protein gene from chromosomal DNA of RH408

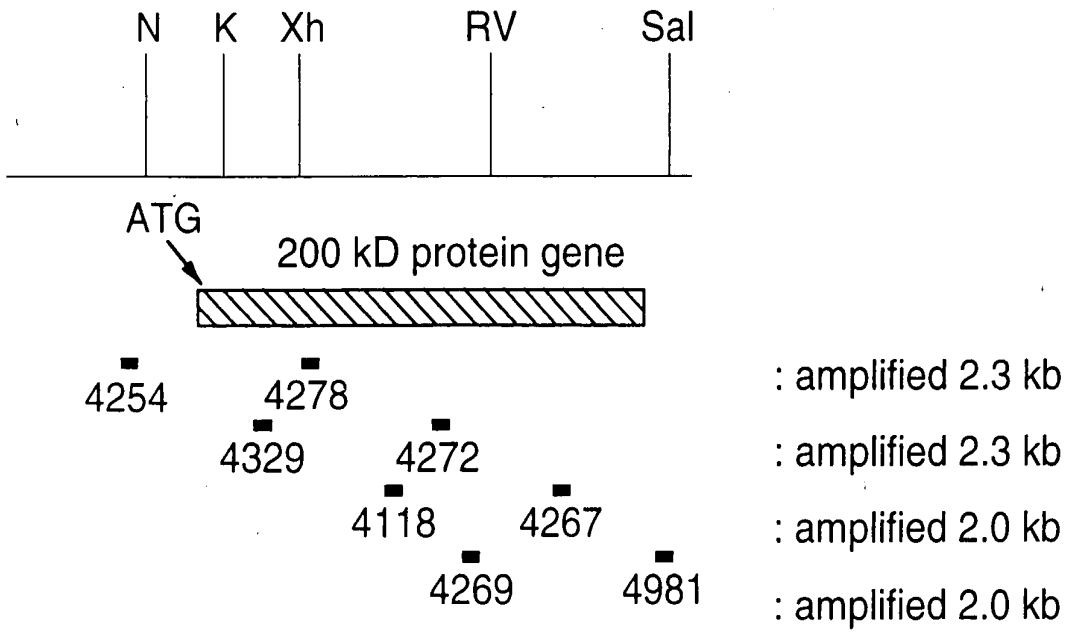


FIG.16

FIG.17A

M. catarrhalis strain 4223 200 kDa

```
C C A T G G A T A T G G G C A G G T G T G C T C G C C T G C
          10                  20                  30
                              ... C G T A T G A T G G C G A T G A C A C C C C A T T T G C C C
                              ...                 40                  50                  60

C A T A T C T G T A C G A T T T G A C A T G T G A T A T G A
          70                  80                  90
                              ... T T T A A C A T G T G A C A T G A T T T A A C A T T G T T T
                              ...                 100                 110                 120

A A T A C T G T T G C C A T C A T T A C C A T A A T T T A G
          130                 140                 150
                              ... T A A C G C A T T T A G T A A C G C A T T T G T A A A A A T
                              ...                 160                 170                 180

C A T T G C G C C C C T T T A T G T G T A T C A T A T G A A
          190                 200                 210
```

FIG.17B


```
                                ... T A G A A T A T T A T G A T T G T A T C T G A T T A T T G T
                                ...                 220                 230                 240

A T C A G A A T G G T G A T G C T A T A T G A T G A T G C C
          250                 260                 270
                                ... T A C G A G T T G A T T T G G G T T A A T C A C T C T A T G
                                ...                 280                 290                 300

A T T T G A T A T A T T T T G A A A C T A A T C T A T T G A
          310                 320                 330
                                ... C T T A A A T C A C C A T A T G G T T A T A A T T T A G C A
                                ...                 340                 350                 360

T A A T G G T A G G C T T T T T G T A A A A A T C A C A T C
          370                 380                 390
                                ... G C A A T A T T G T T C T A C T G T T A C T A C C A T G C T
                                ...                 400                 410                 420

T G A A T G A C G A T C C C A A T C A C C A G A T T C A T T
          430                 440                 450
```

FIG.17C

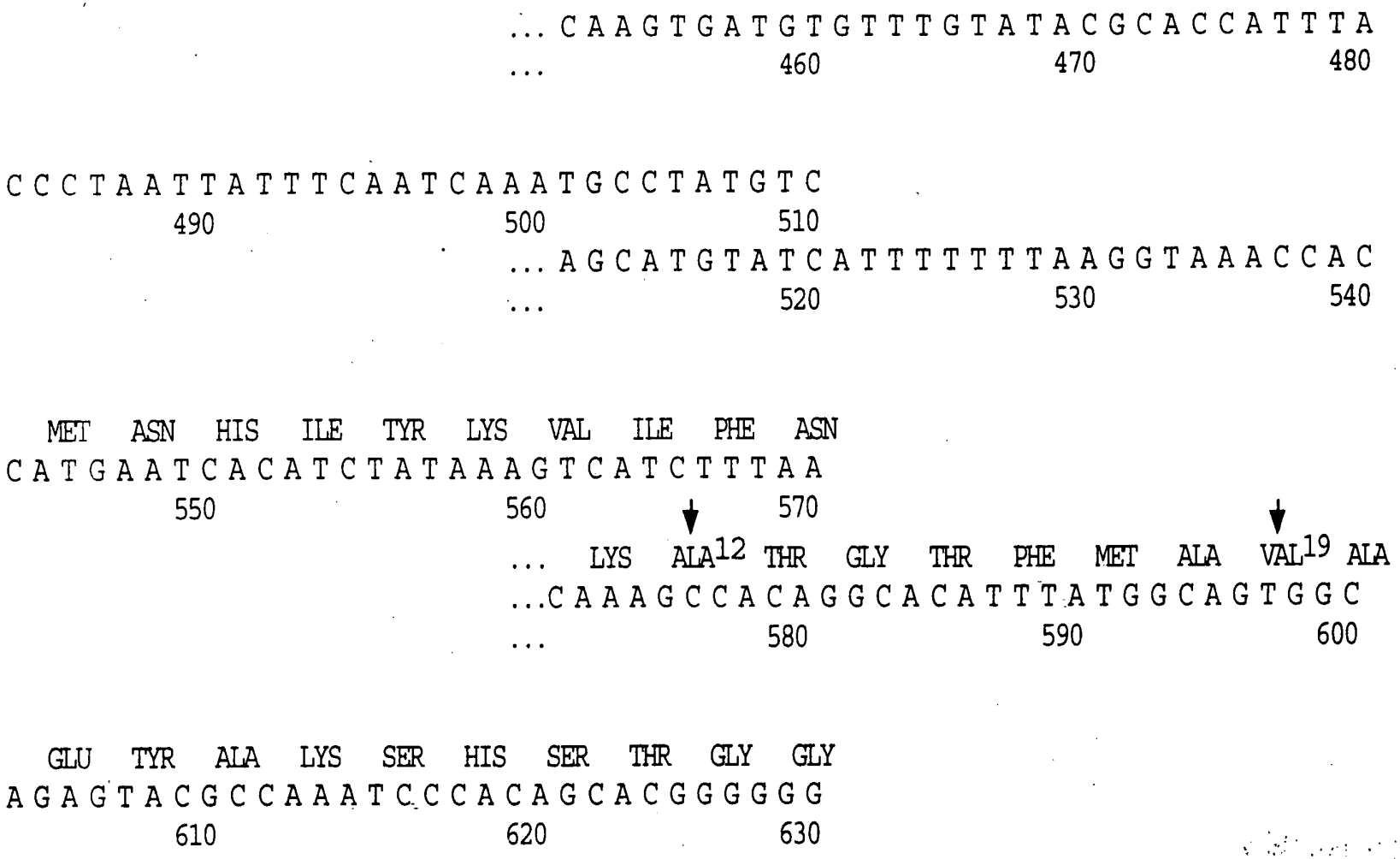
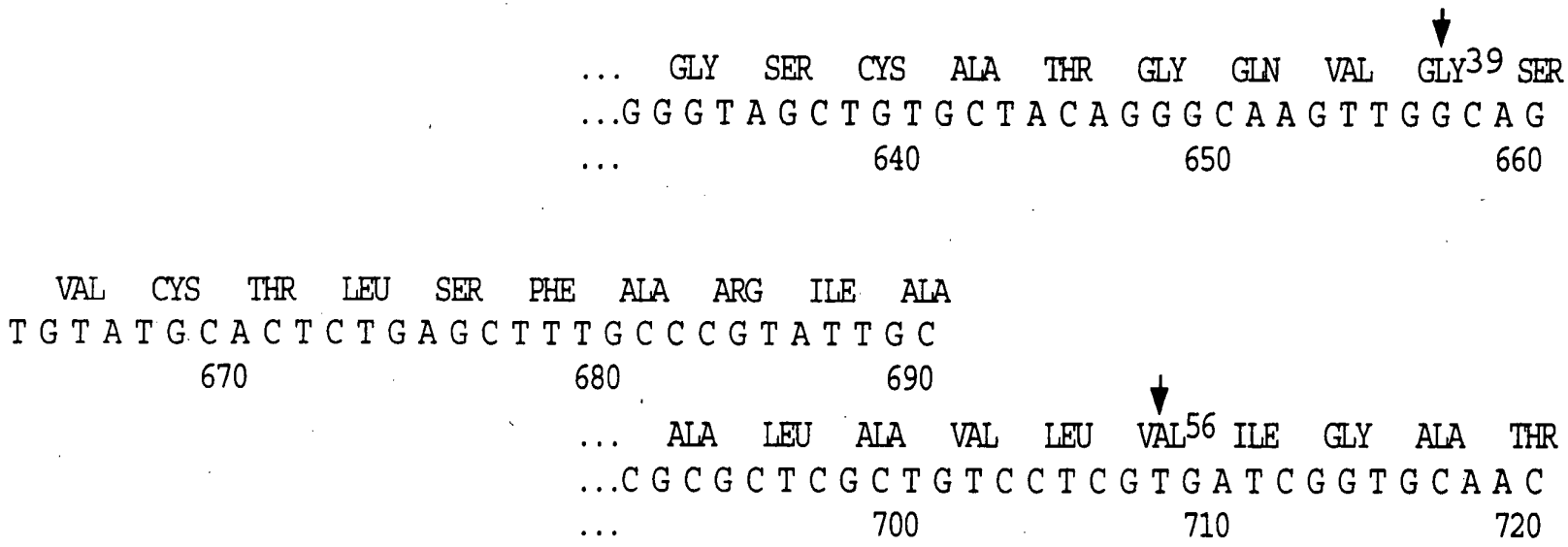


FIG.17D



3' Half Constructs Of 200 kD Protein Gene

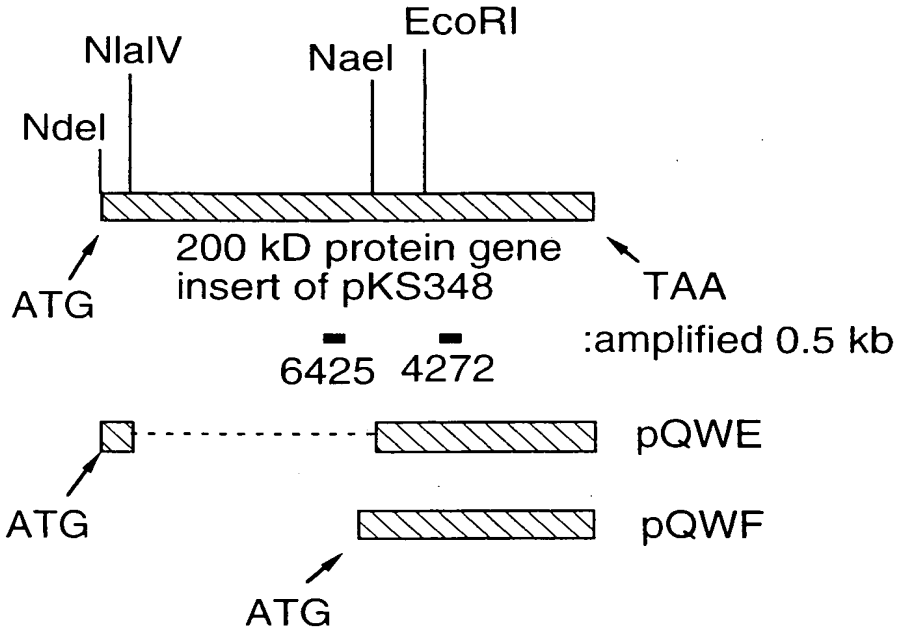


FIG.18

Construction of pQWE

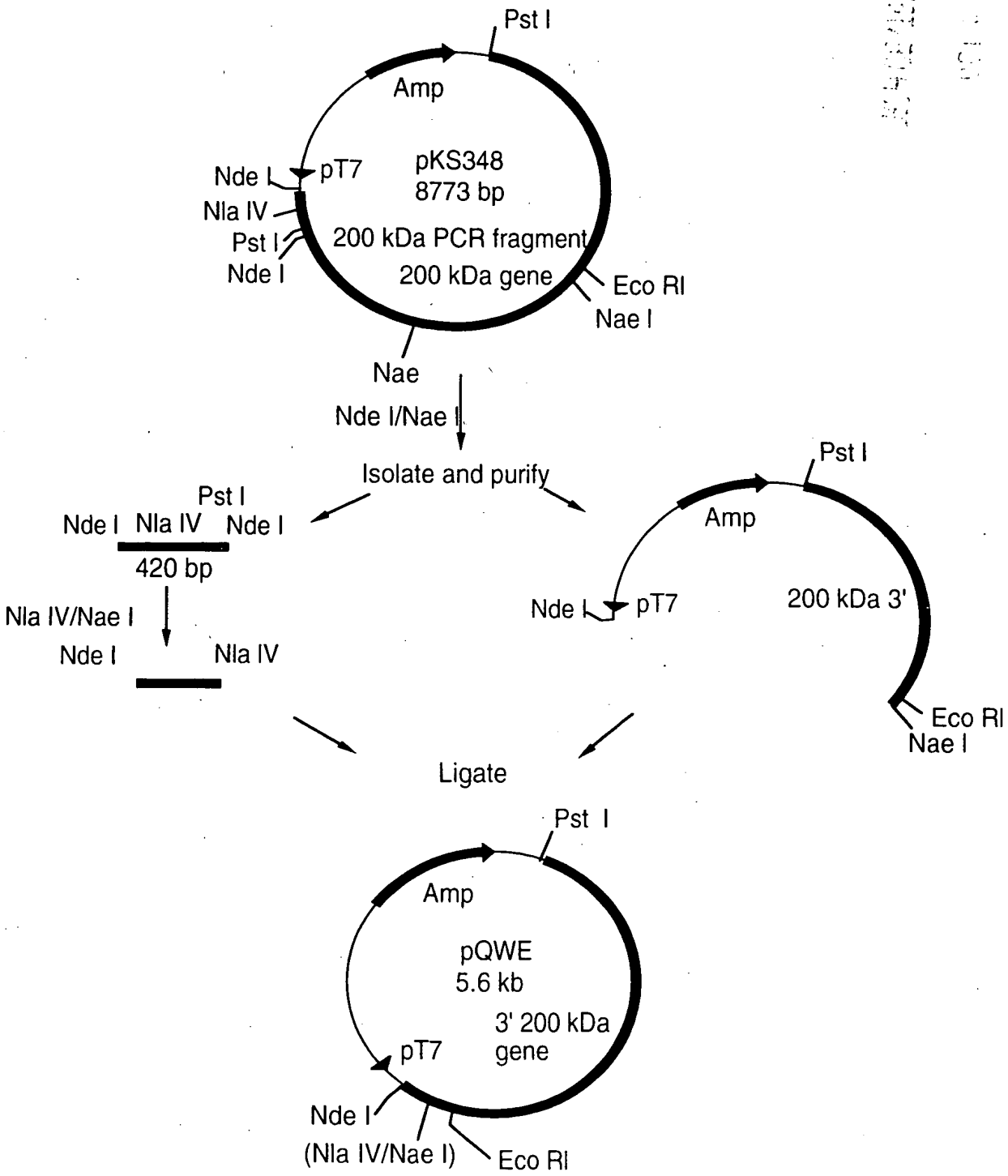


FIG.19

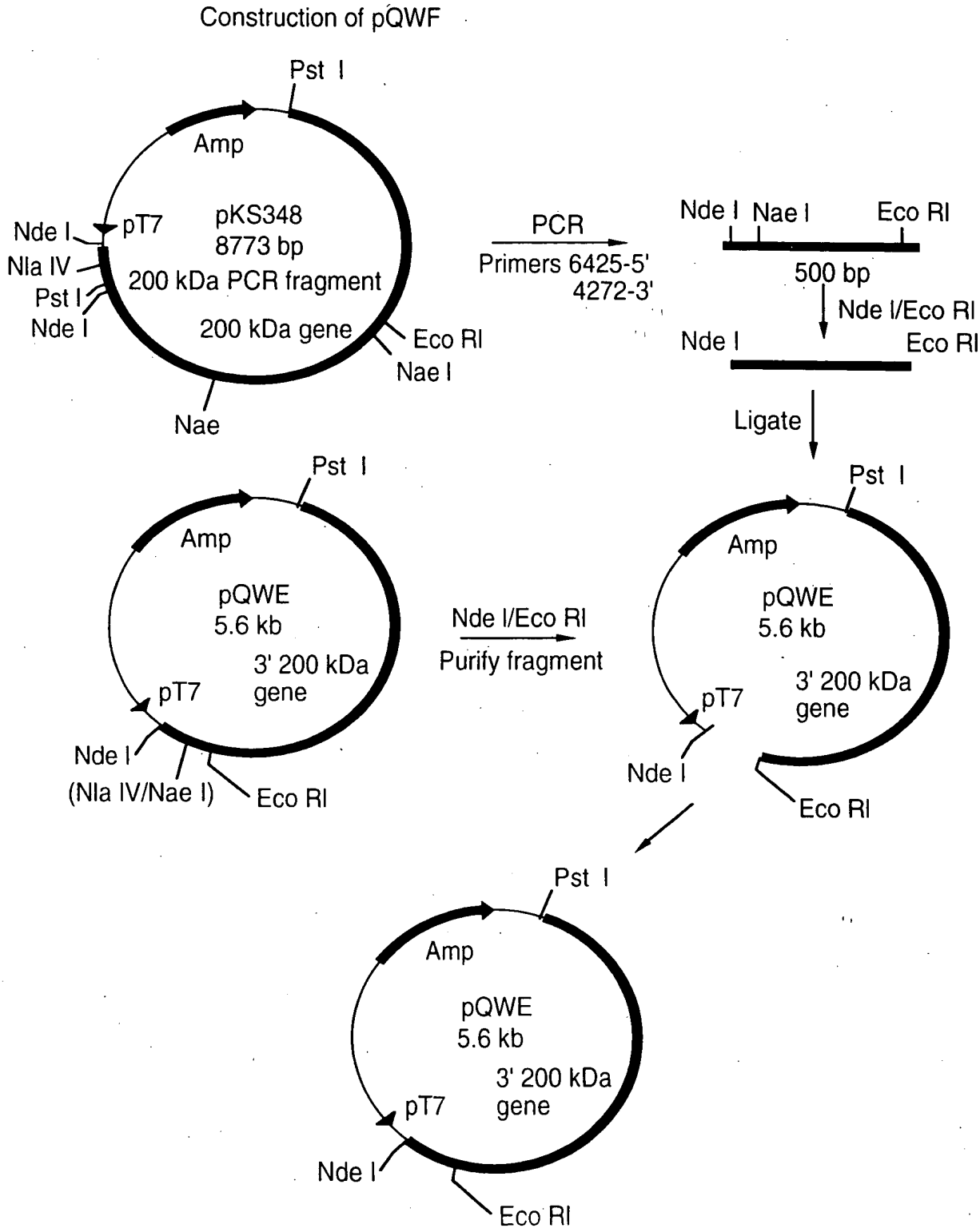


FIG.20